Content and organizational differences between autobiographical and semantic memories

Thesis

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CONTENT AND ORGANIZATIONAL DIFFERENCES BETWEEN AUTOBIOGRAPHICAL AND SEMANTIC MEMORIES

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APPENDICIES

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Content and Organizational Differences Between Autobiographical and Semantic Memories

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ABSTRACT

This thesis investigated differences between semantic and autobiographical memories of the same item.

In a review of the problem area [Part 1] it was shown that the semantic/episodic distinction, SED, [Tulving 1972, 1983] had not been unequivocally supported by research and was open to a number of theoretical criticisms. A revised version of SED focusing on content and organizational differences [as opposed to process differences] between the two classes of memory was shown to be less vunerable to theoretical criticism, to accomodate past findings more fully, and to suggest ways in which the two classes of memory might be more markedly distinguished. The revised version of SED emphasised the autobiographical content of episodic memories and suggested ways in which the two classes of memory may be related.

A series of experiments are reported [Part 2] which investigated the hypotheses that autobiographical and semantic memories of the same items differed in terms of the information that they represented, were differently organized, and were indirectly connected. A number of experimental techniques were employed including free descriptions, priming, property verification, and cued recall of images drawn from either semantic or autobiographical memories. Overall the findings lent strong support to these hypotheses.

It is concluded [Part 3] that autobiographical and semantic memories of the same items differ in terms of the information which they represent and in their forms of organization in memory. These findings validated the revised version of SED which emphasised representational differences such as content and organization rather than process differences and also supported the proposal that that the two classes of memory were represented in a unitary memory store rather than in functionally separate memory stores. The implications of the findings for the study of autobiographical memory, semantic memory, categorization, and imagery are discussed.

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CHAPTER 1

OVERVIEW

This thesis was based on the observation that a person may simultaneously hold an autobiographical and semantic memory of the same item. For example a person may have an autobiographical memory of a chair and a semantic memory of a typical instance of a chair [Rosch, 1978; Mervis and Rosch, 1981]. Two central questions which the thesis attempted to answer were; a] how do these two types of memory differ ?, and b] what relations exist between the two types of memory ?. Part 1 [chapters 2 to 6] considered past work and theorizing into these two questions. Part 2 [chapters 7 to 11] reports a series of investigations of hypotheses relating to the two questions. Part 3 [chapter 12] summarizes the main findings and conclusions, discusses problems related to the research, and considers theoretical implications of the findings.

Part 1

Chapter 2 critically evaluates Tulving's [1972; 1983] semantic/episodic distinction [SED] and experimental investigations of SED are then reviewed. It is shown that SED is not unequivocally supported by the evidence nor, in its current formulation, is it immune from theoretical criticisms. It is proposed that a revised version of SED which emphasises the personal content of episodic memories avoids some of the theoretical criticisms and suggests ways in which the two classes of memory may be more effectively distinguished. The term 'autobiographical memory' is prefered to the term 'episodic memory'.

Chapter 3 reviews research into autobiographical memory and it is shown that that autobiographical memories have been found to represent information about the context in which objects and events were experienced. Research into autobiographical memories also indicated that such memories may connect to script-like semantic memories [Schank, 1975; Schank and Ableson, 1978]. It was noted that autobiographical memories had been found to come to mind in the form of images.

Chapter 4 reviews research and theorizing into semantic memory. It is observed that a general characteristic of semantic memory is that semantic memories are represented in networks. Research into the semantic representation of scripts and categories is then reviewed and a general model of semantic category representation specified. It is shown that past work has heavily implicated general perceptual attributes in semantic category representation. It is also noted that semantic categories at the 'basic' level [Rosch, 1978] have been found to be highly imagible.

Chapter 5 considers recent research and theorizing into imagery and it is observed that virtually all this research has studied images drawn from semantic memory. Theories of imagery [e.g. Kosslyn, 1980] have emphasised the transitory nature of images and argued that images are 'generated' from from underlying memories. It is shown that current theories of imagery postulate that image generation reflects the character of the underlying memories. It is proposed that imagery presents one way in which autobiographical and semantic memories of the same item may be independently accessed.

Chapter 6 states the main aims of the research and the hypotheses to be investigated. The central hypothesis is that autobiographical and semantic memories will be found to differ most markedly in terms of the information that they represent. A secondary hypothesis is that autobiographical and semantic memories will differ in terms of their organization. Finally it was hypothesised that autobiographical memories would be found to be connected to semantic representations of scripts.

Part 2

Chapter 7 reports two experiments. Experiment 1 gathered typicality, or goodness-of-example, ratings of items drawn from nine common categories. Experiment 2 gathered two types of ratings of the imagibility of items drawn from different typicality levels. In the first set of imagery ratings Ss were asked to rate the imagibility of 'typical instances' [TI] of objects and activities named to them. In the second set of imagery ratings different Ss rated the imagibility of 'personal instances' [PI] of the same objects and activities. TI imagery ratings were found to be positively correlated with typicality whereas PI imagery ratings were found to be, in part, negatively correlated with typicality. These results tentatively indicated that autobiographical memories, from which PI images were judged to have been drawn, were not organized in memory in terms of typicality; whereas semantic memories, from which TI images were judged to have been drawn, were organized in terms of typicality. Suggesting that autobiographical and semantic memories were differently organized in memory.

Chapter 8 reports experiment 3 in which two groups of Ss were required to generate and then describe either PI or TI images of the same highly typical and atypical items. These items were selected from experiments 1 and 2. It was hypothesised that descriptions of PI images would predominatly contain context specific information about the imaged item and that descriptions of TI images would predominatly contain information about the general [context free] perceptual properties of the imaged item. It was also hypothesised that information contained in descriptions of TI images of highly typical items would overlap whereas information contained in descriptions of TI images of atypical items would exhibit little overlap [Rosch and Mervis, 1975] indicating that the images had been drawn from semantic categories. In contrast it was predicted that information contained in PI images of highly typical and atypical items would not overlap indicating that these images had not been drawn from either semantic categories or memories organized in terms of attribute overlap. It was found that descriptions of PI images were dominated by experiential context specific information about the imaged item whereas descriptions of TI images were dominated by context free general perceptual information about the imaged item. These findings indicated that autobiographical and semantic memories of the same items differed markedly in terms of the type of information that they contained. The predicted pattern of information overlap was observed for TI image descriptions indicating that these images had been drawn from semantic categories. The information contained in PI images was not found to overlap with the exception of information about the locations in which the imaged items had been encountered. This indicated that PI images were not drawn from semantic categories but that they either contained or connected to, semantic information about locations. It was concluded that autobiographical and semantic memories differed in terms of the information they represented and in terms of their organization in memory and that autobiographical memories contained/connected to semantic information concerning locations.

Chapter 9 reports two experiments. A major criticism of experiment 3 was that the slightly different imagery instructions used in PI and TI may have predisoposed Ss to describe their images in certain ways and so the observed content difference may have related more to nature of the imagery description than to nature of the image. Experiment 4 investigated content differences between autobiographical and semantic memories in a way which obviated this criticism. It was reasoned that, as experiment 3 had found that autobiographical memories contained experiential context specific information and were not organized in semantic categories and that semantic memories contained general perceptual information and were organized in semantic categories, then TI image generation should be facilitated, and PI image generation should be inhibited, by semantic category primes. Three types of prime were constructed, a] picture primes that depicted typical perceptual properties of the category, b] word primes that named the category, and c] a coloured slide that acted as a no-prime. It was predicted that TI image generation would be most faclitated by picture primes, followed by word primes, and would not be facilitated in the no-prime condition. It was predicted that PI image generation would be inhibited by both picture and word primes and that fastest PI image generation times would be observed in the no-prime condition.

A further factor was that of organization. To examine this the typicality level of the to-be-imaged items was varied and stimuli were selected from highly typical [HT], mediumly typical [MT], and atypical [AT], levels. It was hypothesised that in the TI condition image generation times [IGTs] would be fastest to HT exemplars, slower to MT exemplars, and slowest to AT exemplars, whereas in the PI condition IGTs would be similar at all typicality levels.

It was found that TI IGTs were faster to picture primes, slower to no-primes, and slowest to word primes. PI IGTs were fastest to no-primes, slower to picture primes and slowest to word primes. It is argued that for various reasons the word prime effect failed and, in fact, acted to inhibit image generation in both PI and TI. Effects to picture primes and no-primes were as predicted with the somewhat unexpected finding that unprimed PI images were generated marginally faster than picture primed TI images. The results, tentatively, confirmed the hypothesis that semantic memories [TI] contained typical perceptual information which autobiographical memories did not contain.

The predicted typicality effect was observed for TI images and a similar [unpredicted] typicality effect was observed for PI imagers to picture and word primes. It was argued that semantic category primes induced typicality effects in PI. However an unexpected typicality effect was observed in the PI no-prime condition. IGTs were equally fast to HT and AT exemplars but siginificantly slower to MT exemplars. A re-examination of the stimuli suggested that mediumly typical exemplars named objects and activities that may have been less recently encountered by Ss and, so, less recently encoded. It was speculatively suggested that the PI IGTs may have been related to the availablity of autobiographical memories which were organized in terms of recency of encoding. It was concluded that the results, although containing unpredicted findings, tentatively confirmed the hypothesis that autobiographical and semantic memories were differently organized.

Experiment 5 indirectly investigated the suggestion that recency of encoding may have deterimined no-primed PI IGTs at different typicality levels in experiment 4. Ratings of how recently Ss had encountered items drawn from HT, MT, and AT, typicality levels were found to be distributed in a manner very similar to that of no-prime PI IGTs. It was concluded that autobiographical memories were organized, at least in part, in terms of recency of encoding.

Chapter 10 reports three experiments. It was decided that additional normative data would have to gathered in order to investigate content differnces further. Experiment 6 gathered production frequency norms of perceptual and locational attributes given to exemplars drawn from three typicality levels in nine categories. It was predicted that perceptual attributes would overlap in a manner similar to that found by Rosch and Mervis [1975], HT exemplars would exhibit most overlap, MT exemplars would exhibit less overlap, and AT exemplars would exhibit little or no overlap. As experiment 3 had found that locational attributes exhibited some overlap it was predicted that these attributes would exhibit a pattern of attribute overlap similar to that of perceptual attribute overlap but not as marked. Both predictions were confirmed.

Experiment 7 had the aim of replicating the no-prime PI and TI imagery condition employed in experiment 4 and of examining content differences more directly. It was decided to require Ss to verify locational and perceptual attributes of exemplars after generating a PI or TI image of the exemplar. It was predicted, on the basis of experiments 3 and 4, that TI imaging would facilitate the verification of perceptual attributes but not locational attributes, whereas PI imaging would facilitate the verification of locational attributes but not perceptual attributes. It was reasoned that autobiographical memories either contained the required information about the to-be-verified location or connected directly to that information but did not contain nor connected directly to information about typical perceptual attributes. Conversely it was reasoned that semantic memories either contained the required information about the to-be-verified perceptual attribute or connected directly to that information but did not contain nor connected directly to information about locations.

There were two independent variables, image generation time [IGT] and attribute verification time [AVT]. The to-be-imaged exemplars were the same as those employed in experiment 4. It was predicted that IGTs would be similar to those observed in the no-prime PI and TI conditions in experiment 4. It was also predicted that there would be no effect of typicality for AVTs.

All the predictions were confirmed. IGTs indicated that semantic memories were organized in semantic categories in terms of typicality whereas autobiographical memories were organized in terms of recency of encoding. The ATVs indicated that semantic memories contained or connected directly to information about typical perceptual attributes whereas autobiographical memories did not. Autobiographical memories contained or connected to information about locations. It was concluded that autobiographical and semantic memories contained different information and were differently organized.

Experiment 8 employed a similar design to experiment 7. In this experiment Ss were required to generate PI and TI images of the same exemplars as those employed in experiment 7. After image generation Ss were required to recall the exemplars in multi-cued recall test. The cues were perceptual and locational attributes. It was predicted that locational attributes would facilitate the recall of exemplars that had previously been PI imaged but would not facilitate, to the same extent, the recall exemplars that had previously been TI imaged. Conversely it was predicted that perceptual attributes would facilitate the recall of exemplars that had previously been TI imaged but would not facilitate, to the same extent, the recall exemplars that had previously been PI imaged. Both predictions were confirmed lending further support to the hypothesised content distinction.

Chapter 11 contains three experiments which indirectly examined connections between autobiographical and semantic memories. As experiments 3, 7, and 8, had found that autobiographical memories either contained or connected to semantic information about locations and that semantic memories either contained or connected to information about typical perceptual attributes it was decided to examine the structure of these attributes in memory. It was reasoned that information about locational and perceptual attribute structure would facilitate inferences concerning the connectivity of autobiographical and semantic memories. Ss were require to make similarities judgments of sets of perceptual attributes and exemplars [experiment 9], sets of locational attributes and exemplars [experiment 10], and a set comprised of locational and perceptual attributes and exemplars. The resulting similarity judgments were subject to multi-dimensional scaling [MDS]. It was hypothesised that perceptual attributes and exemplars would be found to be distributed around a perceptual prototype whereas locational attributes and exemplars would be found to be distributed in terms of script-like structures. It was further hypothesised that, when judged together, script-like structures [locational attributes] would be found to 'point' to perceptual prototypes.

The findings confirmed the hypotheses. It was concluded that autobiographical and semantic memories of the same items only indirectly connected to each other via script-like semantic representations.

Part 3

In Chapter 12 the findings are summarized, evaluated, and discussed. It is concluded that a semantic/autobiographical distinction [SAD] which emphasises representational differences between the two classes of memory has been found to be a more efficacious distinction than the earlier SED. Autobiographical memories have been found to represent experiential context specific information whereas semantic memories have been found to represent general perceptual information. Semantic memories have been shown to be organized in semantic categories whereas autobiographical memories were not. Thus autobiographical and semantic memories differed in terms of the information that they represented and in terms of their organization. Further it was found that semantic and autobiographical memories of the same items connected only indirectly.

Problems associated with the research are discussed and a number of ways in which the experiments might have been improved are outlined. Implications of the findings for future research are then considered. It is proposed that future research might profitably address the question of organization in autobiographical memory. It is also proposed that semantic memory researchers should extended their investigations to semantic structures other than semantic categories. It is argued that these investigations are prerequisite to the further study of connections between autobiographical and semantic memories.

Part 1

The Problem Area

CHAPTER 2

DISTINGUISHING AUTOBIOGRAPHICAL AND SEMANTIC MEMORIES

In this introductory chapter Tulvings' [1972] original formulation of the semantic-episodic distinction [hitherto refered to as SED] is considered. Experimental investigations of SED are then reviewed. Following this developmental evidence bearing on SED is discussed. Alternatives to SED are then considered and the semantic content of episodic memory is discussed. Finally Tulving's [1983] reformulation of SED is detailed. It is concluded that SED is not unequivocally supported by the evidence nor, in its current formulation, is it immune from theoretical criticisms. It is argued that a revised SED which emphasises the personal content of episodic memory avoids some of the theoretical criticisms and points the way towards investigations that, at the very least, hold the promise of empirically distinguishing the two classes of memory. In order to draw attention to the personal aspect of episodic memories the term 'episodic memory' is rejected and replaced by the term 'autobiographical memory', [c.f. J.Mandler, 1979; Brewer 1982].

2.0 Episodic and Semantic Memories.

Tulving [1972] drew a distinction between 'semantic' and 'episodic' memory in which semantic memory was conceived as "...a mental thesaurus, organized knowledge a person possesses about words and other verbal symbols, their meaning and referents about relations among them, and about rules, formulas, and algorithms, for the manipulation of these symbols, concepts, and relations..." [p.386]. In contrast episodic memory was conceived as "...autobiographical events, describable in terms of their perceptible dimensions and attributes and in terms of their temporal-spatial relations..." [p.387]. Tulving went on to suggest that different retrieval processes might operate on these different memories with different modes of reference, i.e. autobiographical vs. cognitive. Nelson and Brown [1979] summarized these distinctions in the following table, [see over].

These then are the three most explicit distinguishing criteria outlined by Tulving [1972]. Other criteria are put foward but are less clearly stated and appear to be of less central importance [see Nelson and Brown]. The first entry in Table 2.1.1 specifies a 'content' distinction between the two memory classes. The second entry suggests an 'organizational' distinction and

Table 2.1.1 Tulving's Distinction Between Episodic and Semantic Memory
[Extract from Nelson and Brown, 1978, p.235. All entries are quotes from Tulving, 1972, p.385-386]

	Episodic	Semantic
Nature of stored information	Receives stored infor-mation about tempora-lly dated episodes or events and temporal-spatial relations am-ong these events	Semantic memory is the memory neccessary for usage of language
Autobiogra-phical vs. cognitive reference	Always stored in terms of its autobiographical reference to the already existing contents of the episodic memory store	Cognitive referents of input signals
Conditions and conseq-uences of retrieval	Retrieval serves as a special type of input to episodic memory and thus changes the contents of the episodic store	Retrieval of information from the system leaves its contents unchanged

the third entry indicates a 'processing' distinction. It is apparent that these distinguishing or 'diagnostic' [Tulving, 1983] features are not clearly articulated. For instance the entry 'semantic memory is neccessary for the usage of language' suggests a linguistic content of semantic memory. Yet most theorists assume that linguistic knowledge and conceptual knowledge are relatively independent [Ortony, 1975; Miller and Johnson-Laird, 1976]. The point is that Tulving's diagnostic features are somewhat fuzzy [c.f. Tulving, 1983, for comment on this] and, as will be shown below, this has given rise to research which has been equally fuzzy about which diagnostic feature was being studied. In contrast what was particularly clear was Tulving's hypothetical suggestion that the two memory classes were represented in functionally independent systems. A functional distinction is here conceived as being similar to the sort of distinction drawn between long term and short term memory in which different sorts of processes and organization are thought to operate in the two different memories [see discussion of Anderson and Ross, 1980, below, section 1.1]. Further, the two stores are thought of as being represented in different areas of the brain [see section 1.3, below, for further discussion of this point]. One of the purposes of this chapter is to demonstrate that functional independence is not a neccesary criteria of SED and that a modified SED which does not make such an assumption is best able to accomodate experimental findings and theoretical criticisms. A further aim is to consider whether all three of the diagnostic features contained in Table 2.1.1 are equally central to SED.

Tulving [1972] further complicates the specification of SED when he goes on to argue that "...The distinction between episodic and semantic memory systems should not be construed as representing the beginning of some new theory of memory. Rather, the point of view of the two as separate systems represents an orienting attitude or a pretheoretical position whose major usefulness may turn out to lie in facilitating theory construction, without in any way circumscribing the nature of possible theories..." [p.384]. Nevertheless, and as already discussed, it was implicit in the orginal paper that Tulving intended the distinction to be of more than simply heuristic value. Nelson and Brown [1978] also note this equivocation between SED as a heuristic, or as a functional, memory distinction. Thus it is not suprising that, since Tulving [1972], memory researchers have divided on these issues, some holding to SED as a 'conceptual heuristic' only and/or rejecting it wholly in favour of a single-store view of long term memory [Anderson and Bower, 1973; Anderson, 1976; Anderson and Ross, 1980; Baddeley, 1976: Lindsay and Norman, 1977; McKoon and Ratcliff, 1979; McCloskey and Santee, 1981; Schank, 1975; Schank and Abelson, 1977]; while others have elevated the dichotomy to a functional model of memory [e.g.Atkinson, Herrmann, and Westcourt, 1974; Kintsch, 1975; Lockhart, Craik, and Jacoby, 1976; Tulving 1976; Watkins and Tulving, 1975; Shoben, Westcourt, and Smith, 1978; Herrmann and Harwood, 1980; Tulving 1983].

Before considering a less equivocal formulation of the distinction, experimental investigations directly concerned with SED will be outlined. It will become evident that the findings are contradictory and it will be argued that this is related to the failure of reseachers to fully accese episodic memories with a high autobiographical content. It will be argued that at least in part this is a product of the lack of clarity in Tulving's [1972] specification of SED and his insistence that SED is a functional distinction.

2.1 Direct Experimental Evidence.

Although, suprisingly, there is a paucity of research directly concerned with SED the objective of relevant experimental investigations has been to establish whether or not the two types of memory are functionally distinct. Typically this research employs reaction time paradigms that seek to selectively draw upon one store or the other. Shoben, Westcourt, and Smith, [1978] carried out two experiments employing a sentence verification task, assumed to be a semantic memory task, and a sentence recognition task, assumed to be an episodic memory task. Semantic relatedness was found to effect verification latencies but not recognition latencies. Conversely the number of predicates stored with a concept was found to effect recognition latencies but not verification latencies. From these confirmatory findings Shoben et al argued that semantic information was represented by semantic features, [see chapter 4, below, for a discussion of semantic features], whereas episodic information was represented in a more "...surface-like format..." [p.315]. It may be noted in passing that the phrase 'surface like format' implies some type of imagery and, in the discussion of autobiographical memory, chapter 3, the role of imagery will be more fully explicated. Thus Shoben et al conclude that the two stores are functionally separate: semantic memory is organized in semantic networks of features upon which, presumably, process such as spreading activation act; episodic memory is not organized in networks of related features but in some more literal fashion such that size of the input affects recall. The two diagnostic features supported by this finding are those of organizational and processing diferences [second and third entries in Table 2.1.1]

However McCloskey and Santee [1981] strongly criticized Shoben et al's methodology in accessing episodic information, [number of predicates stored with a concept], pointing out that their claims are only valid if it can be shown that the retrieval process they assumed, drawn from HAM [Anderson and Bower, 1973], was correct. McCloskey and Santee went on to argue that Shoben et al's findings can be accounted for by assuming that some aspect of the HAM process model is incorrect, rather than assuming the functional independence of episodic and semantic memory. In addition McCloskey and Santee reported findings lending support to their methodological criticism of the Shoben et al experiment and, more importantly, illustrating that concepts in episodic memory may be represented by semantic features. They conclude by remarking that "...we can see no obvious basis for the claim that semantic and episodic representations are different..." [p.70]. It will emerge that such claims and counter-claims are characteristic of this literature and it is not until studies of autobiographical memory are considered [Chapter 3] that substantive differences become evident. The point to be made here is that the encoding of a list of unrelated sentences most probably gave rise to a memory trace that was primarily dominated by a record of <u>semantic</u> processing performed at encoding. Such memories have little reference to the self and although 'episodic' are probably closely associated with, and very rapidly assimilated to, the semantic system. Hence, perhaps, the failure to observe persistent differences using this sort of paradigm. Whatever the case it is particularly noteworthy that both these studies overlooked the first of the diagnostic features listed in table 2.1.1, namely the content difference.

Further evidence against SED comes from McKoon and Ratcliff [1979]. McKoon and Ratcliff reported a series of experiments employing priming between paired associates in lexical decision and item recognition paradigms. The paired associates were either novel [and therefore, presumably, held in an episodic store], or strongly associated preexperimentally and hence asssumed to activate semantic memory. It was found that the effects of priming were similar in the two conditions suggesting that similar, if not identical, processes were at work in both memory systems. Hence the claim of functional seperation of semantic and episodic memories was not supported. It was also found that semantic information affected decisions that should, logically, have been based on newly learned [episodic] information. McKoon and Ratcliff concluded in favour of the more parsimonious single-store models [see section 1.3 below for a discussion of single store models]. However it was clear that the semantic paired associates used by McKoon and Ratcliff were 'over' learned in comparison to the novel paired associates. Thus, as Herrmann and Harwood [1980] noted, priming in the two conditions was confounded with learning. This was a particularly pressing criticsm as only a short learning period [three seconds] was employed by McKoon and Ratcliff and this may well have accounted for the reliance by their subjects on semantic information in making judgments that should have drawn on episodic information. Herrmann and Harwood employed a more rigorous learning paradigm in their study and were able to show that "...recognition was influenced by the organization used in episodic memorization but not by preexisting semantic organization..." [p.467]. Herrmann and Harwood also pointed out that the McKoon and Ratcliff study was the only study to contradict previous work on episodic priming [McLaughlin and Herrmann, 1972; Herrmann and McLaughlin, 1973] which had generally favoured a functional seperation of SED. Herrmann and Harwood concluded that the contents of semantic and episodic memories were organized differently and hence gave rise to different priming effects. Nonetheless this is not unequivocal, given that the Mckoon and Ratcliff findings were, at least partly, acceptable. It is clear that the episodic memories investigated, in both reports, must have had a high semantic content. Thus failure to take into account content differences, while emphasising organizational and process differences which had not been unequivocally demonstrated, lead to findings, which at best, provide very tentative support for SED.

One further study of particular importance for SED was reported by Anderson and Ross [1980], although the importance of this study resided not so much in the experimental findings as in the reinterpretation of SED which the authors offered. Anderson and Ross reported three experiments which tested whether learning episodic material interfered with the retrieval of semantic information on the assumption that this would not be the case if, in fact, there were two separate memory stores. The results from two of the experiments were predicted by Anderson's ACT theory [Anderson 1976;1983] which makes no semantic-episodic distinction, but were not easily predicted by the Tulving [1972] version of SED. However a third finding was not interpretable by ACT and Anderson and Ross "...attribute the different results to the difference between semantic and biographical memories..." [p.462]. From this they argued for a general distinction between types of memories in terms of the contents rather than functions of different memories. As in the earlier discussion the term functional distinction refers to differences in the processes and modes of organization thought to be specific to separable memory stores. Content distinctions on the other hand refer to "...differences in the types of information being processed...". Anderson and Ross go on to comment, "...The point of outlining this classification of distinctions is to propose that the semantic-episodic distinction has been generally accepted as a functional distiction, when it should have been considered as a content distinction..." [p.464]. However, as has been noted, certain workers have committed SED to some form of content distinction [see Table 2.1.1, above]. What seems to have led most researchers to overlook content was the emphasis placed upon the functional separation of the two classes of memory. Thus research has tended to focus on process and organizational differences. For instance, in reviewing research from his own laboratory Tulving [1976] clearly favoured a functional separation of episodic and semantic memories into independent systems. [Unfortunately this paper was only available in french and a translation of the complete paper was not located, although an english abstract was. Further the reviewed research does not appear to have been published in separate papers nor is it discussed separately by Tulving [1983]. Hence the details of these findings were not available to this researcher].

The conclusion to be drawn from the research discussed so far is that functional separation of semantic and episodic memories into separate systems with different organization and different encoding and retrieval processes is not unequivocally supported. Acceptance of a functional SED remains provisional. Further to this it has been pointed out that, because of the emphasis on functional seperation, the above research has not effectively studied those episodic memories that would be thought to have a high personal or experiential content. Content differences between the two classes of memory have been obscured by the predominant semantic content of the episodic memories selected for investigation. Hence the important point about Anderson and Ross's proposal is that it directs attention towards the autobiographical character of episodic memories. Given that organizational and process differences have proved difficult to effectively investigate, postulating a content based SED may lead to the observation of more clearly marked differences between the two classes of memory. This was, after all, the finding of Anderson and Ross's third experiment.

Prior to detailing the concept of a 'content' distinction further, some relevant developmental research into SED, which emphasises episodic memories with high auotbiographical content, will be briefly discussed.

2.2 Developmental Considerations.

The purpose of touching upon developmental research at this point is to illustrate that research that has focused more on autobiographical episodic memories, than the experimental studies prevoiusly discussed, tends to further confirm the veracity of a 'content' distinction between episodic and semantic memories. Anglin [1977] and Nelson [1978] report interview studies in which it was found that young children [3 to 5 year-olds] placed heavy reliance on personal knowledge in describing 'real-world concepts'. Nelson [1978] comments "...the conceptual network of the young child is derived from personal experience, is functionally based, and is mapped onto language terms directly at first...". Nelson goes on to argue that although conceptual knowledge was drawn directly from experience those experiences were not a central component of the conceptual system. Hence she favours some unspecified form of SED. More explicitly Nelson and Brown [1978] commented that "...Whatever terms we wish to use, we must recognize that the kind of knowledge that is stored in long-term memory derives from the child's experience of events or episodes and that it is stored at least partially in a form that appears to reflect those episodes directly, that is in autobiographical memories..." [p.240]. Thus long term memory is seen by these researchers as being comprised of autobiographical and conceptual knowledge [see section 2.3, below, for further discussion of this].

Studies of word association among young children [Deese, 1965; Entwhistle, 1966; Entwhistle and McNeill, 1970; Petrey, 1977] seem to confirm a developmental sequence similar to that suggested by Nelson. Of concern to present discussion is Petrey's [1977] reinterpretation of syntagmatic-paradigmatic shift [see Nelson, 1977]. Briefly, this 'shift' involves the child developing from relying on syntagmatic word associations, that is associations that do not preserve grammatical form class [e.g. 'high-school' rather than 'high-low'], to associations that do preserve grammatical form class, i.e. paradigmatic associations. Petrey argues that underlying this well documented shift is a shift in cognitive reference from episodic/autobiographical memories to semantic memory [see second entry in Table 2.1.1 above]. Petrey concludes that "...whereas adult's responses are grouped primarily by semantic memory of words' internal content, children's responses display mainly episodic memories of external context..." [p.69].

It thus seems that SED is accepted by at least a number of developmental psychologists as a theoretical concept of some explanatory power. It should be stressed that the use of the term 'episodic memory' by these researchers refers to types of memory quite different from those investigated in the research discussed previously: it is clear that these developmental psychologists interpret episodic memory to refer to 'autobiographical' memories: hence, perhaps, the usefulness of SED in developmental psychology.

2.3 Criticisms of, and Alternatives to, the Semantic-Episodic Distinction.

The discussion has so far examined evidence which although inconclusive lends most support to a content based SED. This section considers alternatives to SED but it will be seen that a content based version of SED obviates many of the criticisms introduced below. There are three general areas of criticism and alternatives to SED and these will be discussed under the following headings: A] Single-store models; B] Multi-store models; and C] Schema models.

A] Single-store models

Section 1.1, above, examined experimental evidence bearing upon SED. Some of these experiments were reported by single-store theorists [Anderson and Ross, 1980; McKoon and Ratcliff, 1979; McCloskey and Santee, 1981]. However single-store theorists have generally ignored SED, e.g. Collins and Loftus [1975]; Anderson [1976]; Rummelhart, Lindsay, Norman, [1975]; Lachman and Lachman [1979]; and others. This is, perhaps, because for many researchers the distinction represented merely a heuristic for distinguishing different classes of research rather than different classes of memory. Yet, as discussed previously, the distinction was very quickly elevated to the status of a theoretical concept and as such should have presented a challenge to single-store models of long term memory. Actually this challenge is more apparent than real because SED only represents a criticism in its functional form. That is, if it is claimed that episodic and semantic memories are stored in different brain areas and that different processes operate within these stores. Certainly this is Tulving's [1972; 1983] position but, as has been shown, the evidence is contradictory on the issue of differential processing. There is some neurophysiological evidence [reviewed by Tulving, 1983, chapter 3] that episodic and semantic memories are differentially effectd by brain injury suggesting storage in separate brain areas. Yet Tulving [1983; p.160] states that he envisages episodic memories as 'feature-bundles' clearly implying some form of network-like memory organization as postulated by virtually all single store theorists [c.f. Anderson, 1983]. If the functional criteria are dropped from SED both semantic and episodic memories could be conceived as being represented in the <u>same</u> network. Further the two classes of memory within the network may be separated by content differences [as Anderson and Ross suggested], and hence different regions of the network may be dominated by different classes of memory. Organization within regions of the network would not neccessarily have to be similar although, of course, all the types of organization that the network could support would be realizable in all areas of the network. This sort of single store-model clearly accommodates a content and, possibly, organizationally based SED and also permits different memory classes to be stored in different brain areas. More importantly such a model invites consideration of how the two clsses of memory may be connected [see chapter 4, below]. Thus single-store models of memory and SED are only mutually exclusive if the notion of functionally distinct memory systems is adhered to. Since the evidence for such a separation is inconclusive a modified single-store SED emphasising content differences may be legitimately adopted as part of the revised SED being worked towards here. This single-store version of SED will be discussed in more detail in Chapters 4 and 6.

B] Multi-store models

SED has been frequently rejected on the basis of the following type of argument: since SED provides no account of, for instance, memory for actions there must be more than two memory 'stores'. In reply to this Tulving [1983] argues that SED only applies to declarative knowledge and that procedural knowledge lies outside the range of the distinction. However Tulving may be understating the range of SED. People can, afterall, recall specific actions as well as perform skilled actions. Thus it is not at all clear that memory for actions lies outside the scope of SED. What is clear is that memory for actions is an under-studied area and little is known concerning the structure and representation of actions in memory. Hence distinctions relating to this class of memories would seem to be premature. With these comments in mind multi-store models of memory will now be briefly examined.

Those workers who argue that certain classes of memory cannot be accomodated by SED typically put foward an alternative proposal featuring a multi-store model of memory. For example Miller and Johnson-Laird [1976] pointed out that 'action-memory' was overlooked by SED and argued that skill memory did not easily fit either episodic or semantic memory systems as outlined by Tulving [1972]. Then, having 'breached' SED, they suggested a five-fold categorization of memory into "...semantic, episodic, action, geographic and person memories,..." [p.151]. One problem is that it is far from clear how this classification, based as it is on the different paradigms used to study memory, extends our understanding of the nature of memory. Given this mode of model building it seems certain that different researchers would quickly 'breach' Miller and Johnson-Laird's five-fold model and very quickly develop a multiplicity of memories. Indeed Tulving [1972] cites a volume of essays on memory [Norman, 1970] in which over twenty five different categories of memory are referenced, [it was this which orginally lead Tulving [1972;p.382] to propose SED]. As Tulving pointed out such a multiplicity, of what must be overlapping, theoretical concepts is indicative of a conceptually weak account of memory. Wittgenstein's [1953; p.232] comment that psychology is in a state of 'conceptual confusion' would seem to be vindicated by such multi-store models. In short, multi-store models, given that they inevitably engender a multiplicity of memories, tend to obscure rather than clarify our understanding of memory.

Further to this Miller and Johnson-Laird do not appreciate that SED, at least in some formulations, is partially a 'content' distinction which cross-cuts their memory classications. As already suggested 'action' memories may be wholly autobiographical or semantic. Similarly 'person' memories may be autobiographical or typical [Canter, Mischel, and Schwartz, 1982]. It is not clear how Miller and Johnson-Laird's multi-store model could accomodate this within-store difference.

A more recent version of the multi-store approach has been proposed by Brewer [1982]. Brewer also argued that skill-memories could not be accomodated within the semantic-episodic distinction and went on to posit a tripartite model of skill, generic, and autobiographical, memory systems where generic memory was sud-divided into 'domains' of which semantic memory was one, perceptual memory another, and presumably there would be others. Yet in practice this does not provide an extension of SED. In essence all Bewer's memory stores other than the autobiographical are semantic stores. Brewer's model, therefore, only differs from SED [a la Tulving, 1972] in it's fuller characterization of semantic memory. It is not after all a different class of model.

A slightly different criticism was put forward by Collins [1975]. He challenged SED by arguing that semantic memories may be temporally ordered. Recall that temporal dating of memories was put forward by Tulving [1972; see Table 2.1.1 above] as one of the criteria that distinguished episodic memories. Having put this criticism Collins went on to argue for the multi-store view which, it has been argued, lead to untenable memory models. However Collins's semantic temporal ordering criticism is particularly interesting in the light of a later paper reported by Roediger and Crowder. Roediger and Crowder [1976] studied subjects' recall of American presidents, designated as semantic memories. Their reasoning was that as Ss could not have episodically encoded the majority of the presidents then that information must have been represented semantically. Roediger and Crowder provided some evidence that Ss were not recalling the presidents from an episodically encoded list, although they acknowledge that most of their Ss may at some time have been required to learn such a list. The main finding was that of strong primacy/recency effects in recall. Chronologically earlier and later presidents were recalled more frequently than presidents from the middle period. Roediger and Crowder concluded that temporal dating was employed in semantic memory and thus could not be singled out as a criteria for distinguishing episodic and semantic memories. This is not a serious criticism for the revised SED being worked towards here: it was earlier argued that if semantic and episodic memories were represented in the same memory network then organizational forms intrinsic to the network may be realized in any part of the network. However the Roediger and Crowder finding clearly demonstrates that although temporal information may be more characteristic of episodic memory it can not sharply distinguish between semantic and episodic memories and hence Tulving's [1972] criteria must be modified. Of these criteria spatial information and the personal content of episodic memories have, so far, remained distinctive, in as much as they have not been challenged by contradictory findings.

Multi-store models then do not present a theoretically viable alternative to SED. In fact it is not clear that they are distinguishable from SED for, it has been argued, any store within a multi-store model may be divided into episodic and semantic memories.

C] Schema Models

This section discusses 'schema' models of memory. For this discussion the central point concering such models is that they postulate semantic memory representations that contain spatio-temporal information. It should be recalled that spatio-temporal information was one of the central distinguishing criteria of episodic memories [Tulving, 1972]. Bower, Black, and Turner, [1979] have investigated schema-like memories and their findings indicate that these sorts of semantic memories do, in fact, contain spatio-temporal information. Thus spatio-temporal information can not be employed to distinguish semantic and episodic memories. However semantic schema-like structures will be discussed separatetly in Chapter 4. Here the discussion will be predominatly concerned with the proposals fowarded by Schank [1975], Nelson and Brown [1978], and J. Mandler [1979] which directly address SED.

One of the earliest and most direct challenges to SED came from Schank [1975; Schank and Abelson 1977]. Schank argued that all conceptual knowledge was based on actual experience and consequently that all memory was episodic. He went onto theorize that episodes were represented by stereotype 'scripts' [Schank, 1975; Minsky, 1975; Schank and Abelson, 1978]. Scripts were postulated to be 'large' conceptual structures that contained informantion about what generally happened in certain similar situations. Schank [1975], Schank and Abelson [1977], give a number of examples of scripts, probably the most well known example being that of the 'restaurant' script where 'plans' of typical action sequences specify how certain 'goals' [e.g. ordering the meal] are to be achieved. Scripts also contain information about the types of objects typically encountered in the situations they depict and information about the locations, times, and actors, associated with the script.

Two points of interest for the present discussion arise from Schank's account of scripts. These are, 1] Schank's claim that the conceptual system is completely based on experience and is, therefore wholly episodic, 2] that scripts contain spatio-temporal information.

Schank's claim for the wholly experiential nature of the conceptual system overlooks a critically important distinction, namely that between knowledge <u>from</u> experience and knowledge <u>of</u> experience [Ortony, 1975; Anderson and Ross, 1980]. Ortony [1975] puts the case strongly: "...philosophers have long argued that although all knowledge might arise from experience it is not neccessarily given in experience.." [p.66]. Further to this Ortony introduces a contrast between knowledge held in an encyclopaedia with knowledge contained in a personal diary, [a contrast paralleled by Anderson and Ross' content distinction], and argues that a 'script' is analogous to an entry in an encycolpaedia. Hence a content distinction can be maintained between semantic and personal memories, for example between memory of a particular restaurant that one has visited and memory of what generally occurs in restaurants [a restaurant 'script']. Schank's criticisms of SED are not, then, as damaging as he might have hoped.

The second problem which Schanks' work poses for SED is that scripts clearly contain spatio-temporal information. Nelson and Brown [1978], in a useful review of various orientations to the semantic-episodic distinstion, touch upon this problem. They concluded their review by favouring "...a usage that distinguishes episodic as a form of memory unit leading to both remembered autobiographical events ['the bear visited my tent'] and the formation of generalized event structures or scripts [what you expect to happen when you visit a restaurant] representing similar repetitive experiences or routines. We conceive of these generalized event structures as one component of an underlying conceptual memory.... We would like to reserve the term semantic memory for the storing of information about words and concepts represented in language..."

[p.240]. However it is clear that Tulving's [1972] original distinction could not permit 'generalized event structures or scripts' as episodic memories even though these contain spatio-temporal information. Indeed the suggestion is antithetical to the concept of episodic for 'generalized events' are abstracted from a number of episodes. They are no longer 'autobiographical events' [Tulving, 1972, p.387]. The view taken here is that generalized events, scripts, and schemas, are semantic structures. As Tulving [1983; p.64] comments, " People are capable of learning many things about the world through their own personal interaction with the world. Some of this knowledge is stored in semantic memory in the form of 'scripts'..". J.Mandler [1979] argues a position very similar to this when she proposes that semantic memory is categorically and schematically organized and contrasts with purerly autobiographical memories of a more 'literal' nature, [this may also be likened to Shoben et al's 'surface-like format' charcterization of episodic memories]. Thus scripts may be represented semantically, presumably having been derived from a number of episodic encodings, and so semantic memories may represent spatio-temporal information. Spatio-temporal information can not then be employed to sharply distinguish between autobiographical and semantic memories as Tulving [1972] proposed and in this sense Schank's work challenges SED.

The criterion which at least some researchers accept, and which has persistently emerged in this discussion as best differentiating semantic and episodic memories, was that episodic memories contain autobiographical information whereas semantic memories do not. This, then, is the 'content' distinction. Subsequent discussion will elucidate and develop the content distinction. In Chapter 6 investigating the content distinction will form the central aim of the research strategy.

2.4 The Semantic Content of Episodic Memories

Thus far the discussion has sought to make a case that semantic and episodic memories are primarily distinguishable in terms of the content of the information they represent. However in section 1.1 above it was recognized that some episodic memories may predominatly contain semantic information. Tulving [1983; p.64] characterizes this in the following example;

"Imagine that late one night a friend telephones you. When you pick up the receiver, he says, "Aardvarks eat ants", and then hangs up. The friend calling you on the telephone, at a particular time, with you in a particular place, and saying something to you, is an episode, probably a memorable one. The utterance is the semantic contents of the episode. You can ask many different questions about the episode and interpret it in a number of different ways, depending upon your knowledge of the world, including your friend; you can also ask questions about the utterance and interpret it in terms of your relevant semantic knowledge, and regardless of whether you remember the utterance as a part of, or independently of, the episode".

Clearly the information that distiguishes the telephone message and semantic knowledge of Aadvarks' eating habits is the experiential content of the former. A further point here is that episodic memories contain information about the context in which an event was experienced whereas this does not neccessarily appear to be the case for semantic memories, [this does not, of course, mean that context can not, or is not, represented semantically]. This sort of content difference may constrain the organization of the two classes of memory [see chapter 4, below].

Tulving goes on to point out that "..once we accept the possibility of the semantic contents of particular episodes, we should always keep in mind the possibility that questions that are assumed to be directed at the semantic system could be answered in terms of the information retrieved from the episodic system", [p.64], and, obviously, vice versa. The central point is that when investigating differences between semantic and episodic memories the two must be clearly distinguished, even though it is accepted that the two classes of memory are, in psychological terms, closely interrelated. To quote Tulving again "..it is difficult to imagine how anyone would seriously wish to resist the idea that the two systems are closely interdependent and interact with one another virtually all the time", [p.65]. The earlier suggestion that the two classes of memory might be conceived of as being represented in the same memory network would seem to be supported by this line of argument. However it is notable that virtually no research has attempted to investigate how the two classes of memory may be connected. To establish the precise nature of SED it is clearly of some importance to determine how the two classes of memory are interrelated. Toward the close of part 2 of this thesis [Chapter 11] some research is reported which suggests at least one way in which episodic and semantic memories may be connected.

In conclusion episodic and semantic memories are clearly closely interrelated. In fact episodic memories may contain semantic information but they are distinguishable by virtue of their personal reference and by containing information about the experiential context. Distinguishing the two classes of memory experimentally is crucial despite their evidently close interrelation.

2.5 Conclusions: a revised semantic-episodic distinction.

Recently Tulving [1983] has further refined SED and this refined version will now be briefly outlined. [Note that this version of SED was published after much of the present introduction was already written].

Tulving presents an expanded and updated version of his 1972 paper in which, "Episodic and semantic memory are conceptualized as <u>two</u> systems that differ with respect to a) the kind of information processed by them, b) characteristics of their operations, and c) their applications in real life as well as the memory laboratory..." [p.9]. It should be clear that the present conceptualization of SED, i.e. content and organizational differences between two classes of memory represented in a unitary memory network, departs from this outline of Tulving's on the issue of separable memory systems and on b). Episodic and semantic memories are not conceived as separate memory systems and, hence, different 'operations' [it is assumed that this term, which is characterized by examples in Tulving 1983, denotes processes and functions of the two classes of memory] are not thought to be localized to one or the other class of memory. Rather both types of memory are thought of as being represented in the same memory network and exhibiting similar 'operations'. Within this network different classes of memories are more or less associated with each other in terms of the content of the information they represent. Thus only section a) of Tulving's revised SED is compatible with the approach taken in this thesis. This is summarized by Tulving in Table 2.1.2, over. Although this thesis does not directly investigate c) the findings to be reported below bear, albeit indirectly, upon the usage of autobiographical and semantic memories in everyday cognition.

The entries 'units', 'organization', and 'reference', summarize the issues to be researched in this thesis. 'Source' and 'Veridicality' are deemed to be outside the scope of present interests [summarized in Chapter 6]. It is contended that the episodic memories selected for investigation should have a high experiential

Table 2.1.2 Summary of Differences Between Episodic and Semantic Memory
[extract from Tulving, 1983, p.35, Table 1.3]

Diagnostic Feature	Episodic	Semantic
Information		
Source	Sensation	Comprehension
Units	Events; episodes	Facts; ideas; concepts
Organization	Temporal	Conceptual
Reference	Self	Universe
Veridicality	Personal belief	Social agreement

content, [self reference]. They should in effect be autobiographical memories. Hence the term episodic will be dropped and substituted by the term autobiographical. The autobiographical units to be investigated will be experienced events, episodes, or scenes. Conversely the semantic units to be investigated will be concepts. Organization has been speculatively touched upon above and is discussed in more detail in chapters 3 and 4, following, where it is argued that the two classes of memory differ in terms of their organization in memory.

The concept of an autobiographical-semantic distinction employed here emphasises representational differences between the two classes of memory in contrast to the processing differences emphasised by Tulving [1972; 1983]. Attention is focused on the diagnostic features of content differences and organizational differences [in that order of importance] because it has been shown above [and will be further explicated below, chapters 3 and 4] that these features hold out the most promise of empirically distinguishing the two classes of memory.

CHAPTER 3

AUTOBIOGRAPHICAL MEMORIES

This chapter considers some of the research into autobiographical memory. Firstly types of autobiographical memory and their contents are discussed [section 3.1]. A separate section [3.2] then examines the relationship of autobiographical memories and schematic semantic memory representations such as scripts, M.O.P's, and scenes. It is concluded that autobiographical memories are closely related to such semantic structures. Finally the specific class of autobiographical memories selected for study is detailed.

3.1 Types of Autobiographical Memories

Tulving [1983] discusses what he calls the 'recollective experience'. Tulving's argument is that accessing episodic memories involves the experience of remembering whereas, accessing semantic memories does not neccessarily involve such an experience. Related to this Esther Salaman outlines a number of types of recollective experience on the basis of her personal experience of recollecting autobiographical memories, in her book 'A Collection Of Moments' [1970; see, also, Neisser, 1982]. Salaman describes two types of memory; those memories that "...come back involuntarily, bring with them strong emotions, and give a sensation of living in a past moment..." [p.63] and those memory fragments that "...carry no strong emotions, do not give the feeling of living in the past, and never come back involuntarily..." [p.63]. The first type of memory are clearly highly emotionally charged autobiographical memories. The second type of memory may be a mixture of non-emotional autobiographical memories and semantic memories. Of the involuntary memories Salaman sugests a further division between "...whole memories, which always contain a disturbance or a shock, and fragment memories which do not..." [p.63]. There are then, three types of memory here: those that must be voluntarily, consciously, retreived; those that arise involuntarily and bring with them an experience of 'living in the past'; and a further group that carry no feeling of 'living in the past' but also arise involuntarily. Salaman's account suggests that the recollective experience of autobiographical memories may or may not involve emotions and may or may not be involuntary. The research reported in part 2 is wholly concerned with 'fragment' memories that carry no strong emotions and that are voluntarily retrieved. Salaman's account also implicates imagery in all the forms of memory that she discusses. It seems clear that, at least in Salaman's case, autobiographical memories were to some extent analogs of experiences. Imagery and autobiographical memory are discussed further below [this chapter] and chapter 5 considers the issue in detail. However, the concern at this point in the discussion, is with studies of autobiographical memories having some emotional content.

Brown and Kulik [1977] reported a questionnare study of what they called 'flashbulb memories' [FB], in which Ss where asked 'what were you doing when you heard the news of Kennedy's assination ?'. FB's were conceived as memories for "...circumstances in which one first learned of a suprising and consequently emotionally arousing event..." [p.71]. Brown and Kulik suggest a possible neurophysiological basis for FBs drawn from Livingston's [1967] 'NOW PRINT' hypothesis. This proposed that a reticular discharge into both cortical hemispheres, triggered by a limbic system response to an event of 'biological meaning', caused all recent brain events to be 'printed' [encoded]. The important findings of the Brown and Kulik study were that Ss recall appeared to be categorizable in terms of five ubiquitous categories [Brown and Kulik refer to them as the 'canonical' categories of recall]: 'Place', 'Ongoing Event', 'Informant', 'Own Affect', 'Aftermath'. Notice that 'time' is not one of Brown and Kulik's categories of recall perhaps calling into question Tulvings' [1972] emphasis on the 'temporal' nature of episodic memory although the time of the assassination was specified in the experimental instructions, hence Ss may have considered it redundant to reiterate this, further the time of learning of the assination e.g. morning, afternoon, evening, etc, was independent of the actual event. Neisser [1982], in a critical review of the Brown and Kulik finding, argued that their 'canonical categories of recall' might also be viewed as 'narrative conventions'. However it is likely that narrative conventions are themselves a product of the form of memory. Further as narrative convention surely includes the unfolding of events over time, and since Brown and Kuliks' Ss did not appear to take advantage of this 'convention', Neisser's criticism remains questionable. A more likely alternative interpretation of these findings is that the 'canonical' categories of recall reflected analogical properties of the memory trace. That is, an image of the event would have included information about location, actions, and actors. The question of how an image might have represented information about 'consequences for the self' requires some elaboration. Possibly, emotions aroused by an event of 'biological meaning' act as the organizing information at encoding. For instance events might be stored in categories of emotions such as, 'events involving fear'. According to this proposal the category contains the emotional information and the image represents an analog of what actually happened. As Brown and Kulik did not report asking their Ss whether or not imagery mediated recall this interpretation remains speculative, although it does seem more in keeping with the notion of flashbulb memories than with Neisser's 'narrrative conventions'.

The above two studies suggested that autobiographical memories may be represented analogically and contain information about the location of, and actors involved in, a recalled event. Studies of non-emotional autobiographical memories lend support to these suggestions. Whitten and Leonard [1981] report one of the fullest studies of non-emotional autobiographical memories. [In passing Whitten and Leonard's definition of autobiographical memory might be noted: "...while the term "autobiographical memory" could be used as a synonym for episodic memory [Tulving, 1972], it is more useful to define autobiographical memory as that set of information pertaining to extra-experimentally experienced events...' [p.566]. Although this is not the definition employed here [see section 1.5, chapter 2] it does indicate the dissatisfaction of these researchers with the autobiographical content of laboratory based studies of episodic memory, see section 1.1, chapter 2 for further discussion of this issue]. Whitten and Leonard report two studies in which Ss were asked to recall the name of one teacher from each of the twelve preceding preuniversity years. Ss were cued forward [grades 1-12], backwards [grades 12-1], or in a random order. In addition, in the second experiment, Ss were also asked to 'think aloud' as they recalled. It was found that backward cueing was most effective in eliciting recall suggesting that the recall of one item facilitated the recall of a contiguous item and also that the probablity of recalling an autobiographical memory was a function of recency, [c.f discussion of Linton [1982] below] The findings of central importance to the present discussion arise from the protocols given by the subjects which revealed a limited number of search strategies. Whitten and Leonard identified four general search strategies [employed within a particular grade]: 'target-subset selection', 'imaged-location traversal', 'cognitive landmark identification', and 'temporal ordering'. The most commonly used strategy was target-subset selection, which in this case, involved Ss selecting a subject grade and locating the name of the teacher of that subject. Similarly the actual grade name acted, in some cases, as a delimiting subset. The second most frequently employed strategy was imaged-location traversal where Ss reported generating an image of their school and mentally walking through various classrooms until they located a particular teacher. The cognitive landmark strategy involved S recalling a significant event in their past and deducing from that who their teacher had been at that time. The temporal ordering strategy simply employed searching backward or forward by some set unit of time e.g. term. Whitten and Leonard also noted that many of the reports involved imagery, physical attributes were commonly reported, and locational searches obviously involved imagery. Thus autobiographical memories were recalled that involved no specific emotional or emotionally arousing content and that yet partlly corresponded to Brown and Kuliks' 'flashbulb memories' in that they contained information about locations and actors and were represented as images. An earlier study by Williams [1978] lead to substantively similar findings. Williams observed 'activity search' [paralleling the target-subset selection strategies outlined by Whitten and Leonard],'location scanning', and 'image scanning' corresponding to imaged-location traversal.

These studies then lend further weight to the characterization of autobiographical memories as taking an analogical form and containing information concerning locations and actors associated with those locations. The two most common organizational forms observed in these studies of autobiographical memory were categorization [e.g. english teachers] and the representation of information in images. This charaterization appears to apply equally to emotional and non-emotional autobiographical memories.

3.2 Autobiographical And Schematic Memory [Scripts].

Linton [1975, 1978, 1982] studied her recall of events from her own life over a period of six years. Linton reports that "...Increased experience with any particular event class increases semantic [or general] knowledge about the event and its context. Increased experience with similar events, however, makes specific episodic knowledge increasingly confusable and ultimately episodes cannot be distinguished..." [1982, p.79]. In discussing her recall of various meetings which she had attended Linton illustrates this effect when she writes "...some years later, after many meetings, I have lost my capacity to reliably pinpoint particular board meetings and I could not describe proceedings of most meetings , except perhaps the first, and [if it were recent] the last..." [p.80]. From Linton's report it seems that there are strong primacy/recency effects in autobiographical memory. This is confirmed by Rubin [1982], who, in an experimental study in which Ss recorded events from their lives and dated them, came to a similar conclusion; namely that retention of autobiographical memories was identical to the retention of words in episodic memory experiments, since a primacy/recency retention function was evident in both cases. In chapter 2 section 1.3 it was noted that Roediger and Crowder [1976] reported finding, primacy/recency effects in semantic memory indicating that this retention function was common to both autobiographical and semantic memories. However as the Roediger and Crowder finding appears to be the only one of its kind, it is perhaps not unreasonable to conclude that primacy/recency effects are more characteristic of autobiographical than semantic memory. Such a suggestion would, of course, be predicted by the single-store model of autobiographical and semantic memories outlined in chape 1 and this is taken up in later chapters [4 and 6].

Returning to the Linton study, the central point she makes is that autobiographical memories gradually 'merge' into semantic memories. However it is not clear whether Linton means that such memories are actually altered, or that the similarity of subsequent experiences renders retrieval cues ineffective. Penfield [1969] from studies involving the electrical stimulation of areas of the cortext reports 'flashback responses' in which patients apparently relived previously irretrievable moments from their past. Loftus and Loftus [1980] were severly critical of this interpretation of Penfield's work pointing out that less than 8% of the 1,132 patients treated by Penfield and his associates reported such experiences, and that there is reason to believe that some of the reports of flashbacks may have been at least partially fabricated. Furthermore Loftus and Loftus, drawing upon the work of Loftus and her colleagues [1975,1979], point out that some memories clearly are modified, as Linton suggested, in favour of the appropriate semantic schema. Loftus and Loftus concluded that "...some memories are apparently modifiable and that, consequently, they are probably unrecoverable..." [p.419]. Possibly one of best studies of this effect is reported by Neisser [1981] in his retrospective study of 'John Dean's Memory'. In this study of Dean's recall of conversations he had with Nixon, the then president, concerning the notorious Watergate burglary and subsquent cover-up, Neisser was able to take advantage of the fact that unknown to Dean all his conversations with Nixon had been recorded. Thus it was possible to compare Dean's trial testimony with actual recordings of what was said. From this comparison Neisser argues that "...The single clear memories that we recollect so vividly actually stand for something else; they are 'screen memories' a little like those Freud discussed long ago [1899]. Often their real basis is a set of repeated experiences, a sequence of related events that the single recollection merely typifies or represents. We are like subjects of Posner and

Keele [1970] who forgot the individual dot patterns of a series but 'remembered' the prototypical pattern they had never seen. Such memories might be called repisodic rather than episodic: what seems to be an episode actually represents a repetition..." [p.20]. The 'repisodic' concept emphasises that repeatedly experienced events which are similar become 'merged' into a semantic structure. Hence more recently experienced events which are in the process of 'merging' with the semantic structure and are more available for recall than less recently experienced events, suggesting how recency effects may occur in autobiographical memory. It might also be speculated that events experienced for the first time remain available for recall because of their 'biological significance', as suggested by Brown and Kulik [discussing Livingston's, 1967, NOW PRINT hypothesis]. However it is difficult to equate this latter suggestion with the well documented phenomenon of childhood amnesia. The central point of Linton's and Neisser's research is that autobiographical memories are closely associated in memory with script-like semantic structures [e.g. board meetings, conversations with Nixon].

Nickerson and Adams [1982] report a study in which they came to much the same conclusion as Neisser. In this study Ss were asked to recall the details of a common object, an American penny. Memory was generally very poor and Nickerson and Adams argue that constant exposure to an object and the ability to recognize that object do not give rise to the detailed representation of that object in memory. They concluded that "...what one is most likely to remember about the visual properties of objects is what one needs to remember in order to distinguish those objects in every day life..." [p.175]. Brewer and Treyens [1981] studied incidental memory for an office and its contents and reached similar conclusions to those of Neisser, and Nickerson and Adams. Brewer and Treyens concluded from their study that "...recall of...items must have been due to schema-based knowledge about offices becoming integrated with the actual episodic information about the experimental room..." [p.228]. It seems that the evidence and current interpretations of that evidence suggest that specific autobiographical memories unless other wise marked [e.g. emotionally] become integrated with, and modified by, existing schema.

Situations, locations, and events, have also been connected to essentially semantic memory structures by Rosch [1978; see chapters 5 for a full account of Rosch's work]. Rosch reported a pilot study where Ss were asked to list events from the previous day, a week ago, and so on. It was found that "...the events listed were just those kinds of events for which Schank [1975] has provided scripts..." [p.44]. However Rosch was also interested in the role of objects in events and further data led her to suggest that "...the task of using a given concrete noun in a sentence appears to be an indirect method of eliciting a statement about events in which objects play a part..." [p.45]. Thus autobiographical memories of events, by virtue of their close association with script-like semantic structures, connect to semantic categories of objects. Bower, Black, and Turner [1979] reached a similar conclusion in their study of memory for scripts. They concluded that scripts 'pointed' towards semantic categories of objects, [this study is discussed in more detail in chapter 4].

More recently Reiser, Black, and Abelson, [1982] have reported two studies employing Schank's [1982] concept of 'Memory Organization Packets' [MOPs]. MOPs represent sequences of generalized scenes, each of which consists of actions to accomplish a sub-goal. For example the Restaurant MOP would contain the scenes 'being-seated', 'ordering', 'eating', and so on. Generalized scenes may be referenced by more than one MOP. Thus the generalized scene 'paying' contains information that is true of paying in general. It is the MOP that contains context specific information that directs or 'colors' the generalized scene to the specific instance e.g. paying for a meal in a restaurant. Reisser et. al. showed that MOPs provided the optimum level of specificity for recall whereas generalized scences proved too specific. From this it is clear that there are different levels of specificity in memory, corresponding to autobiographical memories, generalized scenes, semantic categories, MOPs and so on. It has been shown that autobiographical memories are closely associated with 'generalized scenes' [scripts] and that generalized scenes are associated with semantic categories of objects. This suggests one way in which autobiographical memories may connect to semantic memories and it will be recalled that questions as to the nature of such connections were raised at the close of chapter 1 as being central to research concerned with an autobiographical/semantic memory distinction. The final section in this chapter, then, considers what sort of autobiographical memories would most facilitate investigation of the hypothesised content distinction, organizational differences, and connections, between the two classes of memory.

3.3 Conclusions: Autobiographical Memory for Objects

From the above discussion it should be clear that the focus here is upon non-emotional autobiographical memories: given that so little is known about emotion generally and the role of emotion in memory specifically this would not seem to be an unreasonable bias. The previous discussion may also have suggested that one area of study might be that of investigating differences between autobiographical memory for an event and the corresponding semantic memory for that class of events. However a major problem here is that, with the exception of the work of Bower and his colleagues, there has been little research into the semantic representation of events, [see Schank, 1983, for a review]. Thus such a research aim was not considered feasible in the time available.

The stimuli selected for study were, then, common everyday objects and activities. These were selected because it was reasonable to assume that most people would have autobiographical memories of common objects and activities and because those memories would not generally be of a high emotional content. Also the semantic representation of common objects and activities has been well researched by psychologists in the last decade, [see chapter 5 for detailed acccount]. Furthermore it has been shown that autobiographical memories are connected with scripts-like semantic memory structures that 'point' to semantic categories of objects. Thus content differences, and connections, between autobiographical and semantic memories of the <u>same</u> items are directly investigable. In addition the organization of autobiographical memories of categories of common everday objects and activites can be contrasted with their corresponding semantic representation.

Finally some comments may be made concerning the content and organization of autobiographical memories of common items. Firstly the research reviewed above suggested that typically autobiographical memories will contain contextual information about the encoded item. Information about the location of the items, activities, and actors, may be contained in the autobiographical memory. Also , as Whitten and Leonard found that autobiographical memories of teachers were categorized [e.g. English teachers], it might be predicted that autobiographical memories of common items would also exhibit a categorical organization. The question of interest for an autobiographical/semantic memory distinction is whether or not categories of autobiographical memories of items are similar to semantic categories [of the same items]. Lastly it is clear that autobiographical memories may be brought to mind in the form of images. One of the implications of the research reviewed above is that an image drawn from an autobiographical memory may differ from an image [of the same item] drawn from a semantic memory. This suggests a very direct test of content differences between the two classes of memory and this point is elaborated below [chapters 4 and 5].

CHAPTER 4

SEMANTIC MEMORY AND SEMANTIC CATEGORIES

This chapter elaborates Tulving's [1972], somewhat impoverished, characterization of semantic memory. The first four sections discuss characteristics of semantic memory about which general agreement has emerged since 1972. The following three sections review research into the semantic representation of scripts and categories. The final section summarizes a number of conclusions drawn from the preceding discussion and raises two general issues which have important implications for the proposed investigation of content differences between autobiographical and semantic memories. It is concluded that autobiographical and semantic memories for the same common object are likely to differ markedly in term of the information that they represent. It is also concluded that the two classes of memory may differ in terms of their characteristic organization.

4.1 Conceptual Content

One of the most generally agreed upon characteristics of semantic memory is that it does not contain verbal representations. Lachman, Lachman, and Butterfield [1979], observed that "...every major model of semantic memory assumes that words and concepts are stored separately..." [p.300: see also Collins and Loftus, 1975]. Semantic memory then is viewed as being what Miller and Johnson-Laird have called a 'conceptual domain'. Which accords well with Tulvings' [1972] characterization of semantic memory as a repository of word meanings but not of words. This assumption has not been directly investigated although evidence from word production studies, aphasiology, imagery, and scanning studies has convinced a number of investigators that the assumption is warranted, [Atkinson, Herrmann, and Wescourt, 1974; Collins and Loftus 1975; Lachman, Shaffer, and Hennrikus, 1974; Paivio, 1971, 1975; Kosslyn, 1981]. Many other researchers also subscribe to word/concept representational separation either by way of theoretical considerations or on the basis of anecdotal evidence [see Lachman, Lachman, and Butterfield, 1979, for further discussion]. The general concensus is that words, which are stored in some other separate area of memory, are mapped onto non-linguistic semantic memories.

4.2 Semantic Networks

Virtually all accounts of semantic memory either explicitly state, or implicitly assume, some form of network of semantic entities. Some notable exceptions to this are models featuring formal logics such as predicate calculus [Kintsch, 1974], componential analysis, [Fillmore, 1968, 1969], procedural semantics, [discussed by Clark and Clark, 1977]. However it would be fair to say that these models of semantic memory have not given rise to research as extensive as that engendered by network models. Nor have these models been as successful as network models in accounting for cognition generally. [c.f. Anderson, 1983, for a wide ranging semantic network model that accounts for data from a number of diverse areas including memory, problem solving, learning etc.]. Also the authors of these models provide no criteria which would prevent their models being mapped onto a network structure [c.f. Hollan 1975]. For these reasons, then,the focus here will be upon explicit semantic networks models.

Network models of semantic memory stem from the work of Quillian [1966; 1969], who is also credited with introducing the term 'semantic memory' to psychology [c.f. Smith, 1978]. Since Quillian a number of subsequent network models have been put forward notably by Collins and Quillian [1972], Collins and Loftus [1975], Anderson and Bower [1973], Anderson [1976; 1983], Lindsay, Norman and Rumelhart [1975]: see also Hollan

[1975] on Meyer [1970], Smith, Shoben, and Rips [1974]. These are reviewed by Smith [1978], Woods [1975], Glass and Holyoak [1975]. The concern at this point in the discussion is not with specific models but with the general charateristics of semantic memory which they imply.

Discussing the concept 'semantic network' Woods [1975] observed that "...a semantic network attempts to combine in a single mechanism the ability not only to store factual knowledge but also to model the associative connextions exhibited by humans which make certain items of information accesssible from certain others...". Typically, in a semantic network, meaning is modelled as a set of relations amongst nodes in the network. For example the meaning of the concept 'Robin' is determined by its proximity [connectivity] to the nodes 'Bird', 'Wings', 'Redbreast', and so on. Connections between the nodes form the network. All theorists subscribe to the view that semantic memory is structured and that semantic structures are interrelated but disagree as to the exact form of semantic structures and their interrelations [c.f. Smith and Medin, 1981]. It follows that Tulving's [1972] comment that semantic memory represents relations amongst word meanings may be expanded to state that word meanings are represented in the form of interrelated semantic structures in a network.

Early formulations of semantic networks conceptualized the network as being very similar to a computer data base in which processes [programs] operated on the network [data base]. Related to this, it will be recalled, that Tulving [1972; 1983; discussed in chapter 2] argued that different processes operated upon semantic and autobiographical memories. Thus Tulving [1972] subscribed to a process/representation distinction. However it is not clear that such a distinction can be maintained for anything but heuristic purposes [Kosslyn 1978, 1981]. In pratice determining what effects are the product of mediating structures and processes respectively presents a currently impenetrable problem. On a more theoretical note it is obvious that processes must also be represented. Thus prior to employing a structure/process distinction some criteria must be formulated that separate the two. As no attempt has been made towards formulating such criteria the status of the distinction remains unclear. This argument questions in turn a functional separation of semantic and episodic memories for, if processes and structures are not [currently] separable in principle, it makes little sense to use these concepts in an attempt to distinguish different memories in practice.

Yet there is at least one way in which autobiographical and semantic memories differ in terms of processing. As previously pointed out [see section 1.3 chapter 2, above] semantic structures may be derived from autobiographical encodings then it may be plausibly argued that the developmental processes operating to construct such semantic memories may be specific to the autobiographical memories upon which they operate. In short the developmental processes employed in the construction of the semantic system operate on autobiographical memories only. The focus of this thesis is upon extant autobiographical and semantic memories in adults and so this developmental speculation, although interesting, is outside the range of present interests.

4.3 Spreading Activation

One of the main assumptions of network models is that stimuli 'activate' corresponding [and associated] pre-existing memory representations. Evidence from studies employing various forms of semantic judgments, i.e. priming semantic memory [Posner, 1978], sentence verification studies [Collins and Loftus, 1975], and categorization [Mervis and Rosch, 1981], all suggest that activation of a particular concept leads to activation of connected concepts. This suggests that within semantic memory activation spreads. Collins and Loftus [1975] provide the most complete account of this in the form of a model which was, essentially, an extension of Collins and Quillian [1972], called 'spreading activation'. Their argument was simply that the referent terms in a sentence activated their corresponding semantic representations [nodes] in memory and activation spreading out from these representations along connections in the semantic network meet and summate hence activating other related areas of memory. Spreading activation offers some account of why a sentence such as 'A table is an item of furniture' is verified faster than a sentence such as 'A rug is an item of furniture'. The connecting path in the network between 'table' and 'furniture' is shorter than the path between 'rug' and 'furniture', [Rosch, 1975; Loftus, 1975]. Implicit, then, in the spreading activation model is the assumption of a common process. Semantic judgments are made by activation being channeled through groups of pre-set connections in the network and by inference processes which produce a response based on the state of activation of the system.

More recent conceptualizations of network activation [e.g. connectionist models of cognition, Feldman and Ballard, 1982, Hinton and J.A. Anderson, 1981] based loosely on the neurophysiological model of the neuron, posit that processing is identical in all brain areas and cognition is a product of activation spreading through connections between neuronal-like processing units. It is also proposed that connections may be inhibitory and/or excitatory. Thus activation of two unconnected areas might, in some way, very rapidly inhibit a 'true' response which simultaneously may excite a 'false' response. This suggests a possible mechanism mediating fast judgments of false statements [c.f Glass and Holyoak, 1975]. However connectionist models are in an early stage of development and although they appear to offer general explanations of cognition [rather than just semantic memory] in a way that takes into account known properties of the brain, their status as models of cognition remains to be determined and they have yet to be applied to memory generally. Their relevance to the present discussion is that they posit common and distributed processing of brain areas of different content within a single network. In such a general network regions differ by their characteristic content and the concomitant connections of nodes. Various memory classes are not distinguished by different processes which operate upon them but by different contents and connections. A connectionist model, then, posits a unitary memory network in which autobiographical and semantic memories would be separated by content differences. As both types of memory are represented in the same network there must, therefore, be some connections between memories of different content. In short this is a unitary model of memory which accomodates an autobiographical/semantic distinction based upon differences in content and connectivity [organization]. It thus encapsulates the main conclusion of chapter 2 that autobiographical and semantic memories differ in terms of the content of the information that each represents.

4.4 Semantic Memory and Scripts

In chapter 3 some evidence was reviewed showing that autobiographical memories may contain some semantic information and may connect to semantic memories. It was proposed that autobiographical memories may connect to script-like semantic representations. This section of the discussion considers investigations of the semantic representation of scripts, within the framework of a unitary network.

The discussion so far has focused exclusively on semantic representations of noun concepts and has dealt chiefly with nouns in isolation from all but the simplest of contexts, [i.e. simple declarative statements such as 'A table is an item of furniture']. However studies of context effects have led some researchers to propose that the 'unit' of semantic memory is a proposition, or other unit larger than a concept. This approach represents a challenge to the methodology and models of semantic memory research outline above [c.f. Smith, 1978; Smith and Medin, 1981]. The challenge stems from the work of Bransford and his colleagues [Bransford and Johnson, 1973; Bransford and McCarrell, 1974; Bransford, Barclay, and Franks, 1972; Barclay, Bransford, Franks, McCarell, Nitsch, 1974; Anderson and Ortony, 1975]. Essentially Bransford has been concerned to show the effect of context on memory. In one experiment Ss were given sentences to read such as " The man lifted the piano " or " The man tuned the piano " and then asked to recall the sentences to cues such as 'heavy object' or 'musical instrument' [Barclay et al, 1974] The context appropriate cue was found to be most effective in eliciting recall [e.g.'heavy object' facilitated recall of 'The man lifted the piano' but not the 'The man tuned the piano'....and vice versa] leading these researchers to argue that the meaning of a word is constructed from other words in the sentence rather than, simply, retrieved from semantic memory. Smith [1978], Smith and Medin [1981] attempt to obviate this criticism by suggesting that context allows a listener to 'concretize' the word meaning by computing/activating specific features. They also propose that ambiguity largely relates to superordinate terms rather than category members or features although this is only partly so, for instance 'piano' is not a superordinate. Smith and Medin [1981] acknowledge the ad hoc nature of these proposals and conclude that "...we can do little more than spell out these alternatives and difficulties..." [p.96]. Yet there are two further responses to these findings that Smith and Medin appear have to overlooked.

Firstly the context effects literature has generally examined recall from autobiographical memory. If autobiographical encodings are records of the cognitive environment at the time of encoding, as Tulving [1983] proposed, then the autobiographical memory trace might reasonably be expected to predominatly contain semantic information about the implied context of the sentence. This information would be supplied at encoding by activation of relevant semantic memories [c.f. Dell, Mckoon, and Ratcliff, 1983]. Hence context effects may be localized to autobiographical memories. If this is the case it could be plausibly argued that context effects have yet to be demonstrated for semantic memories.

The question remains as to how semantic memories supply the relevant contextual information at encoding. The second response emphasises the role of script-like semantic memories which represent information about context. In the discussion of scripts which follows it will be shown that a view of semantic memory that incorporates some notion of 'scripts' readily accounts for context effects. In one sense this supports Bransford's argument for scripts are clearly 'larger' semantic units than single concepts. But they are not emergent properties of sentences and, as will be shown, are conceived as 'pointing' to sets of individual concepts.

Schank's concept of scripts [Schank, 1975; Schank and Ableson, 1978; Schank, 1983] was outlined and discussed in chapter 2. A case was made that autobiographical memories were closely connected to script-like semantic structures. The work of Bower and his colleagues [Bower, Black, and Turner, 1979; Bower and Clark-Heyers, 1980; Ross and Bower, 1981] further supports the notion of script-like semantic representations. In a series of experiments, investigating the concept of scripts put forward by Schank and Abelson [1977], Bower et al [1979] found evidence suggesting a hierarchical organization in memory for activities, in which the hierarchy was organized by 'scenes'. It was also found that script related intrusions occured in Ss recall of a text. Bower et al concluded that scripts were analogous to the noun category structures reported by previous semantic memory research and, as such, constituted a previously unexplored area of semantic memory. They went on to suggest that the level of detail recorded with each script was at a high level of generality with specific 'slots' in scripts being 'empty' [see Minsky, 1975] and acting as 'pointers' directing the memory search to relatively context-free information held elsewhere in semantic memory. They concluded with a view of scripts which proposed that "...many scripts will be clustered around the primitive action they enable. Thus the restaurant, bar, and kitchen scripts cluster around ingestion; the bus, train, airplane, and bicycle scripts cluster around physically moving one-self, and so on..." [p.217]. Presumably then lifting-scripts point to 'heavy objects' such as piano's and music-making scripts 'point' to representations of musical instruments. Bower et al's work appears to have influenced Schank [1980] who has modified his memory model and now argues that scripts are constructed in a rule governed manner by 'higher level' general structures, Memory Organization Packets or MOPs [see chapter 2 above].

Bower and Clark-Heyers [1980] extended the findings of Bower et al [1979] and demonstrated that high positive lures in a recognition experiment were incorrectly misidentified as having been part of the original memory set, strongly suggesting that a script had mediated recognition. Further evidence led Bower and Clark-Heyers to contend that scripts acted as emergent superordinates, organizing input. Similarly Smith, Adams, and Schorr [1978], in an experiment examining the confusability inherent in learning similar facts, reached the conclusion that such facts were organized in terms of some script like structure, which also reduced retrieval failure by minimizing trace confusablity.

Finally Ross and Bower [1981], in a series of experiments, evaluated a number of memory models of preexperimentally associated knowledge and concluded that a schema model most easily explained their findings. They proposed that a "...schema is a large conceptual structure preexisting in memory; it interrelates a number of actors, objects, and properties; it gives general information about these categories along with the type of values which fill those variable slots; it can be applied to new cases by instantiating the variables in terms of the value of a particular objects or events in the case at hand..." [p.15].

It is clear from this research that some semantic memories take the form of of script-like structures that specify context. These script-like structures cluster around common actions and point to context free semantic representations. Within the network such representations are presumably superordinate to representations of objects and activities. As Smith [1978] comments "...higher order units [representations for situations]...must take as their input lower order units [representations for words and sentences]...", [p.46]. The next section, then, discusses the representation of 'lower order units'

4.5 Semantic Categories

The title of this section is taken from a review paper by Mervis and Rosch [1981]. The paper presents a view of categorization that has arisen over the last ten years and it is with this view, as represented by the work of Rosch and her colleagues, that the discussion shall initially be concerned. The most extensive research into the semantic representation of common objects and activities has been reported by Rosch and her colleagues. This section will be predominatly concerned with this work and with the type of semantic representation which it implies.

In a series of papers [Rosch 1973; 1974; 1975(a); 1975(b); 1975(c); 1977; 1978; Rosch and Mervis 1975; Rosch, Mervis, Gray, Johnson, and Boyes-Braem 1976(a); Rosch, Simpson, Miller, 1976(b)] Rosch has proposed a 'view' of categorization implicit in which is a model of the semantic representation of categories. The word 'view' is used here because Rosch [1975(b); 1978; Mervis and Rosch 1981] has persistently argued that her work specifies neither a process nor a representational model of categorization. Rather, it is claimed, this work presents 'principles' of, and 'constraints' upon, possible models of categorization. Nevertheless Rosch's work does imply processing and representational accounts [see Rosch 1975(b) for instance] and it is difficult to escape the conclusion that this research was predicated, albeit implicitly, upon such models, [Smith 1978; Smith and Medin 1981]. However before turning to these implied models of categorization two central principles of categorization, expounded by Rosch, will be outlined.

The first principle is that of 'cognitive economy' which states that the task of categorical representations is to provide the maximum amount of information for the minimum amount of cognitive effort [Rosch, 1978 p.28]. The concept of cognitive economy was introduced to pschology by way of Collins and Quillian [1972; Quillian, 1966]. The concept of cognitive economy, then, derives from computing where concern with the economic storage of data was a central issue. Collins and Quillian [1972] argued that networks were a cognitively economic form of data storage. It is not clear that Rosch in adopting the principle of cognitive economy was commited to a network model of semantic category representation. But it will become apparent, in the discussion to follow, that Rosch's account of semantic categories is highly compatable with the notion of network representation.

The principle of cognitive economy is not, however, without its critics. For instance Lachman and Lachman [1979], in considering an evolutionary approach to memory representation, argued that cognitive economy should be reformulated as the principle of 'adaptive' economy. They pointed out that the human memory system is high in redundancy and went on to propose that memory is probably subject to an information/survival trade off rather than an information/effort trade off. The most efficient representational system is not neccessarily the best adapted for survival. Specifically a network type of representation in which concepts are represented only once at a particular node [e.g. Collins and Quillian, 1972; Collins and Loftus, 1975; Anderson, 1983] might be thought to unduely limit the networks ability to survive injury [and hence lower survival value]. Yet although the class of model implied by the Lachman's, is psychologically more sophisticated than the computer derived version of cognitive economy, it has yet to be fully developed and hence will not be employed here. Nonetheless the principle of cognitive economy and the nature of categorical representation are closely bound up with evolutionary considerations as the following discussion will indicate.

In proposing her second principle Rosch asserts that "...the perceived world is not an unstructured total set of equiprobable co-occurring attributes. Rather the material objects of the world are perceived to possess (in Garner's, 1974, sense) high correlational structure..." [ibid, p.29]. According to this proposal attributes in the world occur in 'perceptual bundles' e.g. wings and feathers. Rosch observed that at least two factors contributed to which attributes were represented: a) the functional needs of the perceiver in interaction with the environment, and b) the category system that is already extant in a culture at a given time. Thus there should be an optimum level at which attribute groupings are maximized for economy and survival [Lachman and Lachman, 1979]. A major part of Rosch's work is concerned with specifying such a 'basic' level of categorization.

Two models of categorization implicit in Rosch's work are the 'exemplar' and the 'featural' models and in discussing these models the account of categorization given by Smith and Medin [1981; Chapters 4, 7, and 8] will be extensively drawn upon.

At the core of the exemplar model is the assumption that a concept is represented by separable descriptions of some of its exemplars. It is argued that exemplars usually play a dominant role in categorization because of their accessiblity, other types of information such as summary descriptions of concepts, being less accessible. For instance the concept 'Bird' is defined by exemplars such as 'Robin, Sparrow, Thrush, and the like. One example of the use of exemplars comes from the work of Holyoak and Glass [1975; previously discussed in chapter 4] who found that when Ss judge the truth of sentences such as "All birds are eagles" they employ counterexamples, e.g. 'Robin' rather than summary descriptions. Smith and Medin cite a large body of research supporting the use of exemplars in categorization [p.144]. Exemplars are represented either by descriptions such as 'feathers, wings, redbreast, etc.', or by subsets such as pink flamingo, Chilean flamingo. Rosch [1975(b); Rosch et al [1976(a)] present evidence supporting a version of the exemplar model in which 'goodness' of exemplar has a central role. Rosch [1975(b)] found that people regard certain exemplars as better examples of a concept than other exemplars. Thus subjects judge 'Robin, Sparrow, and Thrush' to be more typical of the concept 'Bird' than 'Ostrich, Penguin, and Bat'. Similarly 'Kitchen Chair' is thought to be a better example of the concept 'Chair' than 'Car Seat'. Additional evidence from Rosch [1975(a); 1975(b)] and others, shows that more typical exemplars are categorized faster [Smith, Shoben, Rips, 1974; Hampton, 1979], than less typical exemplars, are responded to faster when making categorical judgements, are activated by the concept, were better recalled than less typical concepts, and shared more properies in common with other category members. This work demonstrating the role of exemplars in the representation of common objects raises the question as to how exemplars are interrelated in memory.

Rosch and Mervis [1975] account for typicality effects, such as those listed, in terms of 'featural overlap'. In describing this Rosch and Mervis draw on Wiggenstein's [1953] notion of 'family ressemblances'. Exemplars bear a family ressemblance to each other if individuals share some features in the following manner: 'C' can be said to be related to 'A', although they share no common features, by virtue of the fact that both are related to 'B', A<--->B<--->C. Rosch and Mervis formalize this in the concept of 'cue-validity' [Beach, 1964; Reed, 1972]: "...Cue validity is a probabilistic concept; the validity of a given cue 'x' as a predictor of a given category 'y' (the conditional probability of y/x) increases as the frequency with which cue 'x' is associated with category 'y' increases and decreases as the frequency with which cue 'x' is associated with categories other than 'y' increases.... The cue validity of an entire category may be defined as the summation of the cue validities for that category of each of the attributes of the category. A category with high cue validity is, by definition, more differentiated from other categories than one of lower cue validity...." [Rosch, 1978, p.30-31]. Thus categories are seen as related to each other according to how many properties they share with each other and how many properties they share with a contrast class. Robin, Sparrow, and Thrush, which have many features in common with each other and few features with other classes are categorically distinct. As these instances also share many features in common with the superordinate 'Bird' and few with other superordinates they are 'typical' of the concept 'Bird'. Other categories/concepts, e.g. Penguin, Emu, Bat, have few features in common with each other, have few features in common with the superordinate 'Bird', and have featural overlap with categories from other classes, and, so, are 'atypical' exemplars of their class. It may be noted in passing that Murphy [1982] has argued that, on logical grounds, the formal concept of cue validity is not applicable to categorization in this way. Nevertheless cue-validity does capture the central notion that items are typical by virtue of feature overlap and feature contrast. A more recent formal model by Tversky [1978] is, perhaps, not open to Murphy's criticisms although this model is not capable of accounting for the effect of contrast categories [dissimilarity] as it deals exclusively with similarity.

In one of the few attempts to investigate the types of attributes that people actually used in categorization Rosch and Mervis had Ss list features of exemplars, previously judged as typical and atypical, and of the appropriate superordinate concepts. It was found that typical exemplars shared many features with each other and with features of the superordinate whereas atypical instances had few features in common with each other, with other [typical] members of the class, or with the features of the superordinate concept. In contrast they did have features in common with members of other classes. Rosch and Mervis proposed that this 'internal structure' of categories indicated their 'prototypical' nature The concept of a prototype, as used by Rosch and her colleagues, referred to the central tendency of a category. Highly typical instances were said to be more prototypical of a concept in as much as they were closer to the centre of the category. Other researchers have arrived at similar conclusions. For instance Hampton [1976; 1979] described this internal structure as 'polymorphous'. Polymorphous concepts are ones in which an exemplar belongs to a certain category if it possesses a sufficient number of a set of features , none of which need be common to all category members. McCloskey and Glucksberg [1979] present a similar account of the 'fuzziness' of concepts in their property comparison model.

The general featural model outlined by Smith and Medin [p.61-67] effectively summarizes the role of features in semantic categories. The model incorporates two central assumptions; firstly that the representation of a concept is a summary description of an entire class, and secondly that the representation of a concept is some sort of measure of central tendency of the concept's and class's properties. Such properties or features are probabilistically determined. For example a feature of Furniture is 'made of wood' which although possibliy true of Chairs, Tables, Sideboards, is less likely to be true of Carpet, Mirror, Vase and is not necessarily true of any of these items. The point is that such non-necessary features may be true of many items in the class and hence are reasonable additions to the list of concept criteria. Features are weighted according to their probability of occuring with items in the class and according to their probability of co-occuring with other features. Cue-validity, property comparisons, and polymorphous concepts, are all very similar realizations of this general featural model and all try to capture the probabilistic nature of feature/concept inclusion and central tendency. Rosch [1978] has called this the 'horizontal' structure of categories to denote a reference to how exemplars are related to each other within a category level. Rosch also proposed a 'vertical' dimension to categorization in which classes of concepts were separated according to their level of abstraction and this aspect of category representation is now considered.

Rosch and her colleagues [1976(a); 1978; Mervis and Rosch 1981] observe that objects can be categorized at a number of different levels of abstraction and, when these levels are linked together in a taxonomic hierarchy, a particular level is more cognitively salient than other levels. These workers term this the 'basic' level, which is the level at which the information value of the attribute [feature] clusters is maximized. [Earlier in the discusion it was suggested that there were certain meta-theoretical reasons for posititing a basic level i.e. cognitive economy, survival value]. Rosch et al [1976(a)] studied three level hierarchies of common noun categories, e.g. Furniture [superordinate level], Chair [basic level], and Kitchen Chair [subordinate level]. The main findings were that "...the basic level is the most general level at which (a) a person uses similar motor actions for interacting with category members, (b) category members have similar overall shapes, (c) a mental image can reflect an entire category..." [Mervis and Rosch, 1981; p.92]. Further while superordinates were found to share virtually no common attributes, basic level concepts shared numerous common attributes, and subordinates shared even more common attributes. Mervis and Rosch [1981, p.92-94] discuss a plethora of findings, including many reported by other researchers, that support the concept of a basic level. A terminological problem here is that researchers in this area frequently use the terms attribute, feature, and property, synonymously. This convention will be adopted during the course of this discussion but in section 4.6, below, the distinctiveness of the three terms will be established. In considering these issues Smith and Medin concluded that "...superordinate concepts are likely to be described by exemplar representations, whereas subordinate concepts are likely to be described by probabilistic representations..." [p.172]. For example Furniture is represented by 'Chair, Table, Bed, Sofa, etc.', whereas 'Kitchen Table' is represented by features such as 'legs, wooden, top, drawer, etc.'. They further propose that basic level categories are represented by both, e.g. Table is represented by a typical example of table and by a list of features. This is in keeping with an earlier point made by Smith and Medin [p.169] that prototypes are realizable as instances, that is, as exemplars. In other words the prototype of table is realizable as an example or series of examples of tables. It should also be recalled that

Rosch [1976(a); discussed further in chapter 6] found that basic level concepts to be more imagible than concepts at other levels of abstraction. Smith and Medin concluded that "...superordinates probably have no common perceptual properties (as the listings from Rosch and her colleagues indicate), they may well have common abstract or functional properties (which the listings are insensitive to). Thus a superordinate's perceptual properties may be represented in exemplar form (that is, shape is given separately for each exemplar), while its nonperceptual properties are described in probabilistic form that is, as a summary representation)..." [ibid].

Before bringing together the various points raised in this discussion a brief note must be made about 'features'.

4.6 Perceptual Attributes

The above discussion relied heavily on the concept of a 'feature'. This sections examines what sorts of features subjects regard as being associated with common objects.

There are few reports of the features subjects implicitly associate with category terms. In those studies that exist subjects are typically asked to list "...properties and characteristics that people generally attribute to various objects or things..." [Ashcraft, 1976, p.4; see also, Ashcraft

1978;1979; Rosch and Mervis 1975; Hampton 1976; 1979; Smith, Shoben, and Rips, 1974]. Given that subjects list similar properties the resulting production frequency norms are generally taken as indicating underlying semantic structure [ibid]. It is typically found that certain features 'dominate' a concept and/or a class [Ashcraft, 1978]. However examination of these norms shows that Ss rarely include in their listings, attributes other than perceptual properties and simple motor interactions although the former account for the majority of properties. This suggests that, if these sorts of norms do reflect underlying semantic structure, perceptual properties play a dominant role in the semantic representations. The research previously discussed [see also Ashcraft, 1978] provided extensive evidence that perceptual properties played a central role in categorization. More recently Murphy and Smith [1982] in a study employing artifical categories observed that distinctive perceptual features were closely involved with typicality effects. Murphy and Smith reported that <u>only</u> perceptual attributes were crucial to their findings and they comment "...Rosch et al [1976(a)] claimed that objects are categorized faster at the basic level than at the subordinate or superordinate levels because basic categories are associated with more distinctive attributes. Our studies provide strong support for this claim as long as it is qualified to mean perceptual attributes..." [p17]. They went on to argue that perceptual features were closely related to those parts of objects which they frequently named or implied. In keeping with this Hemingway [1981] found that basic level exemplars had more 'parts' in common than exemplars from other levels but that this relationship did not hold for other attributes such as qualities and functions. As functions inevitably involve actions a plausible suggestion is that functions are represented in script-like semantic representation. In chapter 5 it was reported that Bower et al [Bower, Black, and Turner, 1979] found that scripts were organized around the primitive actions that they enabled. Thus in as much as functions involve actions, they may be represented in some script-like format as opposed to discrete features. Murphy and Smith concluded by proposing that natural categorization may have evolved to attend to primarily perceptual attributes [see also Miller and Johnson-Laird, 1976]. This clearly relates to the earlier discussion of the survival value of a basic level of categorization. Given that items represented at the basic level are more cognitively available it would seem to follow that they depict objects in the environment. An animal that could identify food sources and predators very quickly and with little cognitive effort would be well equiped for survival.

The features and properties involved in the representations of common objects are then predominantly perceptual features. Clearly these perceptual features describe the most salient characteristics of the objects with which they are associated. In production frequency lists idiosyncratic responses are rarely more evident than normative responses. For example possession of a green chair does not predispose a subject to include 'green' as a property of chair. It follows that basic level exemplars with which the properties are associated are typical instances that predominantly contain perceptual information. This may be in turn responsible for their imagibility.

In conclusion the terminology to be employed employed in this thesis for referring to aspects of objects will now be clarified. From now on the following convention will be adopted in the use of the terms property, feature, part, and attribute: with the exception of 'attribute' all the terms are taken to refer to perceptual aspects of objects. For example a property of an orange would be it's colour, 'orange'. A feature of an orange would be 'pock-marked skin'. A part of an orange would be 'pips'. Obviously these are only examples and there will be aspects of objects that do not easily fall into this classification. However these distinction have heuristic value for later in the thesis [Part 2] there will be occassions when different aspects of objects will be considered. The term 'attributes' will be taken to refer to all the aspects of an object and this will be modified by terms such as 'perceptual'. Perceptual attributes are all the perceptual aspects of an object including those that are not properties, features, or parts. The term attribute will be most frequently employed.

4.7 Conclusions: Semantic Representation Of Common Objects

It is clear from section 4.5 and 4.6 that Rosch's account of category representation is highly compatable with a network model of memory, although Rosch does not herself draw this parallel. Attributes and exemplars are differentially connected in structured sets.

The following general model of the semantic representation of natural objects may be derived from the above discussion. Common objects are represented by exemplars and by attributes. Further they are represented in categories which have no precise boundaries. Categorical membership is determined by attribute overlap between exemplars, which determines an exemplars centrality to the class. Thus semantic representations of common objects contain attributes and examples of those objects structured in overlapping sets. The role of features and exemplars in these semantic representations varies with the level of specificity of the concept. Superordinates are represented in terms of summary descriptions of their abstract and/or functional properties, e.g. Furniture; is used to store things, sit on, sleep on, decorate, impress friends,...etc. Superordinates are also represented by their most typical [basic level] exemplars. Basic level concepts are prototypical of subordinate classes that contain [primarily] perceptual information. Hence basic level concepts are represented by subordinate exemplars and/or descriptions [i.e. attribute lists or clusters]. Basic concepts are realizable as images. Subordinate concepts are instances of basic level concepts which are represented by their attributes.

There are, of course, a number of questions raised by this general model. For instance does the model apply to representations with more than three levels of abstraction ? How can the model account for 'expert' knowledge of natural objects ? Does the model extend to more abstract concepts ? [c.f. Hampton, 1981]. Can the model account for the combination of concepts, e.g. pet fish [c.f. Smith and Medin, 1981, for further discussion of this]. These questions are beyond the scope of the present thesis. The aim here is to investigate differences and similarities between these semantic representations and parallel autobiographical representations. To this end the research to be reported in part 2 of this thesis primarily confines itself to investigating concepts at the basic level and, more specifically, employs the stimuli so intensively researched by Rosch and her colleagues. Inevitably issues that relate to categorization will arise and these will be discussed as they occur. However such issues will be subordinate to the central goal of the thesis which is to investigate content differences between semantic and autobiographical memories.

In conclusion the general model of category representation suggests two questions of direct relevance to the hypothesised content distinction. The first is, are autobiographical encodings of objects representented in a manner similar to that of corresponding semantic representations i.e. by attributes, ?. It will be recalled that Tulving [1983] proposed that episodic memories might be thought of as 'feature bundles'. Also the extensive literature on cued-recall suggests that episodic memories contain separable attributes. There is therefore the possibility that autobiographical memories may be represented by attributes. This leads to the second question: are autobiographical and semantic representations of the same basic level concept comprised of the <u>same</u> attributes ?. This will form one of the central hypotheses of the research reported in part 2 of this thesis and is discussed further in chapter 7.

CHAPTER 5

IMAGERY AND THE AUTOBIOGRAPHICAL/SEMANTIC DISTINCTION

In chapters 3 and 4 it emerged that imagery was involved in autobiographical and semantic memories. This chapter discusses imagery both generally and imagery as it relates to the autobiographical/semantic memory distinction. The use of imagery to study content differences between autobiographical and semantic memories is considered.

The first section considers the relationship of imagery and memory. Particular attention is given to the work of Kosslyn [1980].

The second section discusses the case for two types of image: firstly images drawn from semantic memories, and secondly images drawn from autobiographical memories.

The third section briefly considers imagery methodology.

It is concluded that imagery constitutes the most direct method for investigating content differences between autobiograpical and semantic memories.

5.1 Imagery and Memory

Two approaches to imagery are considered in this section; a] studies of the role of imagery in long-term memory and, b] studies of imagery in short term memory, [Holyoak, 1980; Richardson, 1980]. These two approaches are not mutually exclusive and both of these approaches emphasise the relations of imagery and memory. [The imagery/proposition debate will not be discussed. This omission is reasonable given Anderson's [1978] argument that imaginal and propositional models are not theoretically distinguishable and given that the concern here is with the content of memories rather than with their representational format].

The first approach is best typified by the work of Paivio [1971, 1975, 1978] which has centered on the role of imagery in long term memory. J.T.E. Richardson [1980] has called this the 'elaborative' approach to imagery. It is concerned with the function of imagery as an organizing parameter in long-term memory [c.f. Haber, 1981], as an aid to recall, and as a means of representing meaning. Paivio [1971; 1975(a); 1975(b)] has proposed a dual-coding model of imagery and verbal representation which contains the following proposals: firstly two codes in which to represent experience are available, imaginal and verbal, and although these codes are independent they are associatively related; coding [of the same item] in both modes leads to superior accessibility in comparison to single coding; secondly the imagery system permits simultaneous coding of multiple pieces of information whereas the verbal system employs sequential coding; thirdly images are "...analogue representations of perceptual information..." [1975(a), p.145], or, in other words, records of perceptions. Paivio supported his model with a number of experimental investigations [c.f. Paivio 1971; 1975(b)]. However in a recent review of the literature J.T.E. Richardson [1980] concluded that the dual-coding hypothesis, as presented by Paivio, was not supported by the evidence: not all meanings are represented by images; dual coding does not necessarily facilitate recall; images are not records of perception. Although dual-coding has not received unequivocal support by in subsequent research, certain aspects of the elaborative approach are still generally agreed upon: some long term memories are represented in an analog format; some long term memories may be arrayed along analog dimensions [such as size, shape colour and the like]; and at least some, if not all items are coded both verbally and imaginally. Analog representations, then, play some role in long-term memory and may be accessed by words. It will be proposed, below, that appropriate verbal instructions may access images of autobiographical or semantic memories.

In contrast to the elaborative approach to imagery the second approach considered here [the constructivist approach] has attended to the 'privileged' and 'emergent' properties of images. According to this view images are conceived as being transitory representations. Research and theorizing in this area is best typified by the work of Kosslyn and his colleagues [see Kosslyn, 1980 for an overview]. Kosslyn puts foward a theory of imagery in which visual mental images are conceptualized as transitory data structures that occur in an analog spatial medium. These 'surface' representations are generated from more abstract 'deep' representations in long-term memory and, once formed can be operated on in certain distinct ways. Thus images are said to be quasi-pictorial and are represented in a medium that mimics coordinate space. Images are generated from underlying deep structures that Kosslyn characterizes as being either 'literal' or 'propositional'; "...literal information consists of encodings of how something looked, not what it looked like; an image can be generated merely by activating an underlying literal encoding. Propositional information describes an object, scene, or aspect thereof and can be used to juxtapose depictive representations in different spatial relations..." [p.51]. Kosslyn went on to argue that in retrieving information from memory a 'horse race' takes place between propositional fact retrieval and imaged fact retrieval. Studies of the use of imagery in fact retrieval led

Kosslyn to conclude that "...imagery is likely to be used in fact retrieval if the fact is about a visible property of an object that a person has seen and it has not been considered frequently in the past..." [p.54]. For example in answering the question 'how many windows are there in the front of your house ?' most people report generating an image and 'reading' the answer off that image, whereas answering the question 'do houses have windows ?' is usually not mediated by imaged fact retrieval.

It might be argued that this distinction is parallel to the autobiographical/semantic memory distinction since autobiographical memories can be seen as literal encodings and semantic memories as propositional encodings. However this connection is not made by Kosslyn and indeed his distinction refers exclusively to semantic memory. Moreover it is possible to apply Kosslyn's literal/propositional distinction to autobiographical memories themselves. In other words there may be both propositional and literal representations of experiences. For example habitually going to the same place may give rise to some form of 'over-learned' propositional autobiographical memory. In contrast going to a number of similar places will eventually, give rise to a semantic memory of that class of places [recall Linton's account of her own memory for meetings, discussed in chapter 3]. The position taken here then is that both autobiographical and semantic memories may be represented propositionally or literally.

Kosslyn further outlines various privileged properties of the imagery medium such as specialization for making size and shape comparisons, representing visible properties, and facilitating the manipulation of representations. The work of Shepard and Metzler [1971], Shepard and Cooper [1973], Metzler and Shepard [1974] into the mental rotation of visual images provides evidence for the latter point. Shepard [1978] argued that one of the privileged properties of imagery was that in the process of some transformation, such as rotation, images maintained a one to one correspondence with actual objects in the world so that, if the imaged object and the veridical object were simultaneously rotated [at the same speed], the two objects would be isomorphic to each other at all points in the transformation. Such one to one isomorphism is not preserved by more abstract transformations.

The elaborative and constructivist approaches taken together make four central points about imagery. Firstly images may be accessed by words. Secondly images are constructed from underlying memories. Thirdly images are represented in some transitory form. Fourthly imagery facilitates certain types of manipulation, e.g. fact retrieval, size comparisons, mental rotations. As the present aim is to investigate content differences between autobiographical and semantic memories the research in this thesis will be will be concerned with the second and fourth of the above points: the generation of images from different types of memories, and nature of the information contained in such images [see chapter 6].

5.2 Two Classes of Image

The elaborative and constructive approaches to imagery both emphasise the close relationship of imagery to memory, although 'memory' here must be qualified to mean semantic memory. Commenting on this Tulving [1983] observed, "It is not without interest in the present connection to observe that little mention has been made of episodic memory in the currently flourishing literature on mental imagery, even when the imagery-work or thinking about it has has been done by theorists with known interests in, and contributions to, the study of episodic memory [e.g. Anderson, 1978; Kolhers and Smythe, 1979; Kosslyn, 1976; Neisser, 1972; Paivio, 1976, 1977; Shepard, 1975, 1978; Simon, 1972]. Almost invariably, the images of the contemporary theories of imagery reside in, or come from, what in the episodic/semantic distinction of memories would be regarded as the semantic part.", [p.186].

In keeping with Tulving's comment is Rosch's finding that basic level concepts are more likely to be realized as images than are other classes of concepts. In experiments using a signal-detection paradigm and a priming paradigm [Rosch et al, 1976(a), Posch, 1975(b)] basic objects appeared to be the most abstract categories for which an image could be representative of the class as a whole. Presumably these images of basic level concepts were drawn from semantic memories. Note also that both Rosch and Kosslyn asked their Ss to generate images of 'typical instances' of objects. Commenting on this, Block [1981] pointed out that it is often supposed that prototypical representations are from the same class of entities as images: "...If prototypes are in the same natural kind as mental images, and if prototypes are as important in thinking as now appears to be the case, then the issue of the nature of mental images is closely connected to the question of the nature of human thought..." [p4]. Also, as previously noted, basic level concepts contain primarily perceptual attributes [Murphy and Smith, 1982], suggesting a basis for their imagability. It follows that images drawn from semantic memories should frequently represent typical perceptual attributes of a class of objects. For example if an S is asked to generate an image of a typical 'table', it may be expected that a he/she will have in mind some analog representation depicting common properties of tables. Thus semantic memories of common objects may be imaged.

It will be recalled that virtually every study of autobiographical memory reviewed in chapter 3 indicated that autobiographical memories were frequently imaged. Whitten and Leonard found that imagery was form in which Ss most frequently recalled their school teachers: even when Ss reported searching categories of school teachers the eventual recall was in the form of an image. Yet it seems unlikely that an image drawn from an autobiographical memory would contain primarily common properties of the imaged object. As observed in chapter 3, an autobiographical image is more likely to contain information about the context in which an item has been experienced. For example an image of a table drawn from an autobiographical encoding might represent the table currently in a person's kitchen. Such an image would only contain general perceptual attributes of tables in as much as these were a part of the imaged object; perceptual attributes contained in autobiographical images would usually be specific to the imaged object rather than typical of that object. Thus the content of images drawn from autobiographical memories would be, predominatly, comprised of information specific to the experienced context.

Imagery may, then, constitute a fairly direct means whereby differences in the content of underlying memories can be examined.

5.3 Imagery Methodology

There is a methodological parallel between imagery research, in both the elaborative and constructivist approaches, and semantic memory research. Both types of research have employed chronometric measures [see Posner, 1978] to invesigate memory representations. While semantic memory researchers have studied reaction times to phrases and words, imagery researchers have studied the times taken to generate images, to manipulate images, and to verify properties contained in images. Clearly the time taken to generate an image will reveal something about the underlying memory trace. For instance Glass and Meany [1978] in an experiment employing an image generation time paradigm found that exemplars of low typicality were of two types: one type, that exhibited slow image generation times, were categorized more slowly because it took longer to retrieve descriptions of the exemplars; and a second type, exhibiting faster image generation times, were categorized more slowly because it took longer to compare descriptions of exemplars against a description of the category. The image generation times, then, indicated that exemplars of low typicality did not form a homogeneous group. Glass and Meany concluded that imagery was "the best measure of how much a subject knew about an instance" [1978; p.623]. Image generation times, then, may be employed to study aspects of underlying memories. Similarly the time taken to verify properties of generated images may be employed to examine the content of images and, hence, to further infer the nature of the underlying memories.

5.4 Conclusions

It is concluded that both autobiographical and semantic memories may be represented as images. Times taken to generate images and to verify information contained in images may indicate differences in both the content and the organization of the underlying classes of memory.

It is difficult to envisage how content and organizational differences could be directly investigated by means other than imagery. In chapter 2 it was shown that in previous research into autobiographical memory typically requiring Ss to learn unrelated sentences and/or phrases, these memories could be judged to have a high semantic content. Hence, differences between the two classes of memory may have been obscured. Rather than compelling Ss to encode autobiographically the aim of the present research was to investigate autobiographical memories which had been encoded extra-experimentally. This was in keeping with past studies of autobiographical memory [chapter 3] which had also investigated extra-experimentally encoded autobiographical memories. Similarly, in the great majority of studies, extra-experimentally encoded semantic memories had been studied. In conclusion, since imagery involves the retrieval of those memories from which the image is generated, it appears to be the most direct way of investigating both autobiographical and semantic memories.

CHAPTER 6

THE RESEARCH AIMS AND HYPOTHESES

This chapter outlines the general and specific aims of the research to be reported in part 2 of this thesis. The first section specifies the general aim of the research. The second section discusses the stimuli to be used. The following three sections detail specific hypotheses drawn from the discussions in earlier chapters. The sixth section considers the types of methodology to be used and the experimental strategy. Finally the specific research aims are summarized.

6.1 The Research Aim

The central goal of this thesis is to investigate content differences between autobiographical and semantic memories. It is expected that the findings from these investigations will lead to an account of the representation of autobiographical and semantic memories and their relation to each other. Hence the central research aim is to present an overall account of the representation of the two classes of memory. It is intended that this overall account will specify well established differences between the two classes of memory as well as areas that await investigation and the type of investigations that might be undertaken.

6.2 The Stimuli

It was, decided to investigate autobiographical memories of common everday objects and activities. This had the advantage of employing stimuli the semantic representation of which had been extensively investigated. In chapter 4 the semantic representation of 'natural' categories was outlined and a general model specified. The natural categories studied by Rosch comprised some nine categories of everday objects and activites. This may seem a small sample of all categories, however as Rosch [1975(b)] pointed out this group of categories comprised the nine most frequently occuring categories in american-english and so may be judged to be representative of categories of common objects and activities generally. Furthermore, as Smith and Medin [1981] observed, semantic memory researchers have yet to extend their studies, fully, to other types of categories and concepts. Hence the selection of these stimuli would seem to be in keeping with current semantic memory research.

6.3 Content Differences

The main argument drawn from chapter 2 was that autobiographical and semantic memories were most likely to differ in terms of the content of the information that they represent. The main hypothesis of this thesis is that autobiographical and semantic memories differ in terms of content. Other hypotheses concerning differences between autobiographical and semantic memories will be considered below, however these are secondary to the central hypothesised content difference.

From the discussion in previous chapters it was clear that content differences between autobiographical and semantic memories had not, previously, been directly investigated. Any content differences that had been observed were incidental to the research discussed above, as in the Anderson and Ross study [1981, see section 1.2, chapter 2]. Thus the nature of content differences remains a matter of speculation, albeit intensive speculation. From the discussion in chapter 2 and from the reviews in chapters 3 and 4 of autobiographical and semantic memories, it was evident that theorizing and research indicated that autobiographical memories contained information about the experienced context whereas semantic memories did not. The semantic memories of basic level exemplars, discussed in chapter 4, were seen to contain, primarily, context free perceptual information concerning the represented object.

It is hypothesised that content differences between autobiographical and semantic memories take the following form: Autobiogrpahical memories of common objects and activities contain information about the context in which the item was experienced, and contain context bound perceptual information. For example an autobiographical memory of 'chair' may contain information about the experienced context, 'in living room at home', and context bound perceptual information, 'an old green simulated leather chair which looks a bit worn'. Semantic memories will not contain contextual information but rather will contain information about typical perceptual attributes of the item. For example a semantic memory of 'chair' would contain information such as 'legs, back, seat, wooden, arms,' and so on.

Experiment 3 in chapter 8 reports a preliminary investigation of the content hypothesis in which subjects described images of items drawn from either autobiographical or semantic memories. Experiments 5, 7, and 8, chapters 9 and 10, report experimental manipultations of different aspects of content in relation to autobiographical and semantic memories.

6.4 Organizational Differences

A second, and less central, hypothesis is that sets of autobiographical and semantic memories differ in terms of their organization. This hypothesis is secondary to the content hypothesis because organizational differences between the two classes of memory will be only indirectly investigated. It was felt that the organization of autobiographical memories constituted a research topic in itself and, therefore, could not be fully and explicitly investigated given the main research aim of examining content differences. Yet as, presumably, different contents may give rise to different types of organization it is clear that content and organization are, to some extent, related. It was decided, then, to examine whether autobiographical memories were represented in semantic categories, similar to those discussed in chapter 4, rather than directly investigating autobiographical memory organization.

In chapter 4 the organization of semantic memories in categories and the inclusion of those categories in hierarchical levels of abstraction was outlined. It was shown that this semantic organization was based on some form of attribute overlap in which items with considereble overlap were more central to their category than items with less overlap. The structure of semantic memories poses a number of questions relating to the structure of corresponding autobiographical memories. Firstly are autobiographical memories similarly organized in categories ?. Secondly, if autobiographical memories are categorically structured, are these autobiographical categories the same as, or similar too, the semantic categories ?. Thirdly are autobiographical categories determined by attribute overlap ?. Fourthly, if autobiographical categories are determined by attribute overlap, are these the same attributes which determine semantic categories ?.

In chapter 3 Whitten and Leonard's [1981] finding that autobiographical memories of subject's school teachers were, at least in part, organized categorically [e.g. english teachers, fourth grade teachers, etc.] was discussed. This finding clearly indicated that autobiographical memories may be categorized. However it is not clear, primarily because of lack of research, whether this is also true of autobiographical memories of common objects and activities. Although this is obviously an area of some interest it is also suspected that it is a very complex area and thus could not be investigated in any depth in the present thesis, i.e. as a secondary hypothesis.

This thesis will <u>not</u> directly investigate categorization of autobiographical memories. However it is feasable to investigate whether autobiographical memories are organized in the same way as semantic categories. This can be easily achieved by varying the typicality of the stimuli: If autobiographical memories are organized in categories similar to semantic categories, or if they simply directly connect to a corresponding semantic memory, then the typicality effects [discussed in chapter 4, section 4.6] habitually observed for semantic memories should also be present for autobiographical memories. The typicality of stimuli are varied in all the experiments reported in part 2 and in all experiments similarties and differences in organization between autobiographical and semantic memories are considered. However, with the exception of experiment 6, chapter 9, and experiments 9 to 11, chapter 11, organizational differences are secondary to investigating content differences.

The questions relating to the use of attributes in autobiographical memory organization are closely related to the hypothesised content differences. If it is found that autobiographical memories do contain seperable attributes then it might be assumed that these may be employed in the organization of autobiographical memories. Although not directly investigated in the thesis, chapters 7 and 11 provided some data indirectly bearing on this issue. Further to this if it is found that autobiographical memories do not contain similar information to semantic memories then clearly the two cannot employ the <u>same</u> attributes in determining organization. Chapter 8 reports findings bearing upon this issue.

The central hypothesis concerning organizational differnces is simply that semantic memories are subject to typicality effects which will not be evident for autobiographical memories. As other specific hypotheses about organizational differences are largely dependent on the findings concerning content differences these will be considered when, and if, suggested by these findings.

6.5 Connections Between Autobiographical and Semantic Memories

One of the consequences of the rejection of Tulving's [1972; 1983] functional distinction between semantic and episodic memories [see chapter 2] was the accecptence of a unitary model of memory, [multi-store models were also rejected, see chapter 2]. The unitary model of memory discussed in chapter 4 emphasised the connectivity of memories within a single memory network in which different classes of memories are distinguished by their content and concomitant connections. Within such a model it is clear that autobiographical and semantic memories [of the same item] must have some connections with each other. It is appropriate, then, that this thesis should have something to say concerning the relations of autobiographical and semantic memories.

If autobiographical memories contain, primarily, contextual information, as hypothesised above, then they may connect to script-like semantic representations, [see chapter 3]. Script-like representation 'point' to other context free semantic representations [see section 4.5, chapter 4]. Thus context free semantic representations may connect to corresponding autobiographical memories via some form of script-like representation. Chapter 11 examines this hypothesis.

6.6 The Invesigative Strategy

The investigative strategy was that of 'converging operations' [Garner, 1974; Rosch, 1978]. This strategy was felt to be most appropriate because of the lack of relevant past work upon which to base experimental paradigms and because this strategy had been employed, for similar reasons, successfully by Rosch [1978; Mervis and Rosch, 1981]. The central idea of coverging operations is simply that evidence gathered from a number of different sources [in this case different experimental methods] cumulatively supports one overriding interpretation, even though alternate interpretations may be brought to bear on the findings of individual experiments. In the research reported below descriptions of images, image generation times, priming images, cued recall, attribute verification times, similarity judgments, and attribute production frequency norms, constituted the manipulations and dependent variables; the findings of which converged on the hypothesis that autobiographical and semantic memories differ in terms of content: Autobiographical memories represent information about the experienced context whereas semantic memories represent information about general [perceptual] attributes.It is important to note that although a particular finding may be interpretable in more than one way it will be shown that alternative interpretations do not account for other specific findings nor for the overall pattern of the results.

6.7 Summary and Other Issues

The central topic of the research is that of content differences between autobiographical and semantic memories. It is hypothesised that autobiographical memories represent context specific information whereas semantic memories represent context free information.

Secondary to this is the topic of organizational differences between the two classes of memory. It is hypothesised that semantic memories are organized in semantic categories in terms of typicality whereas autobiographical memories are not organized in semantic categories in terms of typicality.

A third issue concerns the connections between autobiographical and semantic memories. It is hypothesised that autobiographical memories connect to script-like semantic representations which in turn 'point' to context free semantic categories. Thus the connection between semantic and autobiographical memories of the same common items is via script like semantic representations.

It is inevitable that in the course of the research findings will emerge which bear more directly on other issues e.g. categorization and imagery [outlined in chapters 4 and 5]. Although these additional issues will be recognised at the appropriate place in the thesis further discussion will be defered to chapter 12. In chapter 12 the implications of the findings for categorization, imagery, and other issues, will be assessed and discussed.

Part 2

The Research

CHAPTER 7

TYPICALITY AND IMAGERY

In this chapter two experiments are reported: the first is designed to gather normative data about the stimui to be used throughtout this research; the second experiment also has this aim, but in addition looked at the relationship of typicality to different classes of imagery.

The gathering of normative data at this stage was felt to be of particular importance because the subjects to be used in this series of experiments, Open University adminstrative staff and psychology students, are somewhat different from the subject population usually drawn on by semantic memory researchers, i.e. first and second year North American psychology undergraduates. Open University students take a part-time correspondence degree stretching on average over a six year period and frequently are in full employment throught out the course of their degree. These students tend to be older, with an average age of early 30's ranging from early 20's to post retirement age [65+], and are more broadly distibuted across the full range of socio-economic sub groupings. For these reasons, then, the accuracy of current norms such as typicality ratings [Rosch, 1975], imagery ratings [Paivio, Yuille, and Madigan, 1968], and property norms [Ashcraft, 1976], can not simply be assumed. Although there is likely to be some overlap it is equally likely that there will be important differences between norms gathered from culturally distinct groups, such as North American undergraduates and Open University students [see Brown, 1978; Rosch, 1975].

Experiment 1

Typicality Norms

7.1 Introduction

In chapter 4 it was observed that normative ratings of the perceived centrality of an exemplar to a category have been taken as reflecting underlying semantic structures. For example Rosch [1975(b), experiment 1] had subjects rate items according to how best the item fit their "idea or image of the meaning of the category name" [p.197]. From the resulting data Rosch was able to construct 'goodness-of-example' category norms depicting the typicality element of internal category structure, [see also Ashcraft, 1978].

The validity of these norms is established in subsequent experimental investigations. Rosch [1975(b)] reported a sequence of experiments in some of which Ss made similarity judgments of pairs of exemplars drawn from different typicality levels e.g. high, medium, and low, typicality. Judgments of pairs of highly typical exemplars were faster when subjects were primed with the category name than when unprimed. Further, judgments of pairs of highly typical exemplars were generally faster than judgments of pairs of exemplars previously judged to be less typical of the category. These findings strongly supported the assumption that typicality was an organizing factor in the underlying semantic representation of categories.

In chapters 9 and 10, of this thesis, experimental manipulations of exemplars drawn from different typicality levels are reported. However the present concern is simply to replicate Rosch's 'goodness of example norms' [1975(b), experiment 1] on the present subject population. This is felt to be necessary because Brown [1978] in a replication of the Battig and Montague [1969] category norms, with U.K. subjects, observed some important differences in the production frequencies of individual items. To take an extreme example, in response to 'a type of dance', U.S. subjects second most frequently produced response was 'frug' whereas this dance did not appear in the U.K. production frequency responses.

For these reasons it is predicted that the U.K. 'goodnes of exemplar' norms will exhibit a similar typicality structure to that observed by Rosch, but that there will be notable differences in the perceived goodness-of-example of individual exemplars by U.K. and U.S. subjects.

7.2 Method

A single group of Ss were required to rate on a 7-point scale their judgment of the typicality of exemplars drawn from a group of categories. Order of presentaion of exemplars and categories was random within the constraints specified below, [see Materials]. The data was collapsed across Ss and internal reliability assessed by random split-half rank order correlations. These norms were also correlated with the norms reported by Rosch [1975(b)].

Stimuli

The stimuli were taken directly from Rosch [1975(b) experiment 1, p.197] which employed the following stimulus selection procedure: Rosch selected the most commonly used categories, categories the exemplars of which could be unambiguously represented by simple pictures. She rejected categories that had a part-whole structure [e.g. parts of the body, parts of buildings], categories with multiple superordinates [e.g. animal is commonly used as a synonym for mammal], and categories the superordinate of which cross-cut a number of taxonomies [e.g. food]. The ten categories eventually selected were: fruit, bird, vehicle, vegetable, sport, tool, toy, furniture, weapon, and clothing. As these categories are all contained in the Battig and Montague [1969] production frequency norms of instances given as members of categories, Rosch selected the exemplar lists from this source. Exemplars were taken from Battig and Montague if they had a production frequency of ten or more. Thus ten superordinate categories each with 50 to 60 exemplars were constructed.

In this experiment nine of these categories were employed: fruit, bird, vehicle, vegetable, sport, toy, furniture, weapon, and clothing. [The tenth category [tool] was randomly eliminated to reduce the size of the total stimulus set and hence the time taken by Ss to complete the ratings]. Translations from American into English were undertaken where the experimenter deemed neccessary. [e.g. 'drapes' to 'curtains'] and these were infrequent. The complete list of exemplars is contained in Appendix A, Table 7.1.1.

Materials

An experimental booklet was constructed in which all members of a category were listed below the category name on a single sheet of paper and this was done for all nine categories. The nine sheets were combined into a booklet the front page of which contained the instructions. Next to each exemplar was printed a numbered seven point rating scale. The distribution of exemplars on any one page was randomly selected from a group of thirty random orderings of each category and the ordering of pages was selected randomly from the 9! possible page orderings. Page order and order of presentation of exemplars were combined so that no Ss received all the stimuli in exactly the same order, although some Ss received the same random orderings of exemplars within a category, or the same ordering of pages, as other Ss.

Subjects

Subjects were Open University staff and students. The Open University staff Ss were all members of The Open University subject panel and numbered 42. The students were taking either second or third level courses in psychology and numbered 72. Mean age of all Ss was 34 [to nearest year] and the range was from 19 to 55. 114 Ss took part, 68 females and 46 males.

Procedure

Open University staff took part in groups of 8 to 12 at the Open University. Open University students took part in groups of 4 to 20 while attending a seven day residential psychology summer school, at either Warwick or Sussex universities. Ss were given the following instructions [taken from Rosch, 1975(b), p.198]: "This study has to do with what we have in mind when we use words which refer to categories. Let's take the word 'Red' as an example. Close your eyes and imagine a true red. Now imagine an orangish red...imagine a purple red. Although we might still name the orange red or the purple red with the term 'Red' they are not as good examples [as clear cases of what red refers to] as the clear "true" red. In short some reds are redder than others. The same is true for other kinds of categories. Think of dogs. You all have some notion of what a "real dog", a "doggy dog" is. To me a retriever or an alsatian are very doggy dogs while a Pekinese is a less doggy dog. Notice that this type of judgment has nothing to do with how well you like the thing; you can like a purple red better than a true red but still recognize that the colour you like is not a true red. You may prefer to own a Pekinese without thinking that it is the breed that best represents what people mean by dogginess.

In this experiment you are asked to judge how good an example of a category various instances of the category are. In the rest of this booklet are listed nine categories with a number of examples for each category. At the top of each page is a category name and beneath it are a list of examples of that category. Next to each example are the numbers 1 to 7 and you are asked to ring one of these numbers to indicate your judgment. A 1 means that you feel the member is a very good example of your idea of what the category is. A 7 means that you feel the member fits very poorly with your idea or image of the category [or is not a member at all]. A 4 means you feel the member fits moderately well. For example one of the members of the category 'Fruit' is 'Apple'. If apple fits well your idea or image of fruit you would ring a 1; if apple fits your idea of fruit poorly you would ring a 7; a 4 would indicate moderate fit. Try to use the full range of numbers on this 7-point scale so as to finely discriminate your judgments.

Don't worry about why you feel that something is or isn't a good example of the category. Remember different people will have different opinions. Try to mark it the way YOU see it."

Ss then completed the ratings in their own time. At completion Ss recorded their age, sex, nationality, and whether English was their first language or not. Ss were paid one pound.

7.3 Results

Of the 114 Ss data from 12 Ss [9 males and 3 females, all Open University students] was rejected on the basis that either English was not their first language or that they were not resident U.K. nationals. The analysis was conducted on the ratings of the remaining 102 Ss.

Rank orderings and mean ratings of goodness of example of all instances of all categories are shown in Appendix A, Table 7.1.1; also shown are the corresponding ranks from Rosch [1975(b), experiment 1]. Reliability of the ratings was assessed by Spearman rank order correlations and Pearson product moment correlations on the following divisions of the data: A] between two separate split halves of Ss divided at random, B] between Open University staff and Open University students. Consistency was high, the split-half correlations were all .91 or higher, and the correlations between Open University staff and students were all .90 or higher. Table 7.1.2, over, lists the Spearman rank correlation coefficients. These findings compare favourably with Roschs' split-half correlations which were all 0.97 or higher and, for a geographical division of Ss, were 0.92 or higher.

Table 7.1.2 Spearman rank correlation coefficients [rho] between split-half and staff-vs-students divisions of goodness-of-example ratings.

Category	Split- -half rho	Staff- vs-Students rho
Toy	0.9105	0.9016
Sport	0.9145	0.9079
Vehicle	0.9794	0.9547
Weapon	0.9511	0.9442
Clothing	0.9732	0.9014
Furniture	0.9761	0.9700
Fruit	0.9523	0.9615
Bird	0.9626	0.9581
Vegetable	0.9776	0.9752

Table 7.1.3 Spearman rank correlation coefficients [rho] between U.K. and U.S. Goodness-of-Example category norms. [Ordered from lowest to highest correlation].

Category	rho
Bird	0.5558
Vegetable	0.5958
Toy	0.7705
Sport	0.7282
Furniture	0.7396
Fruit	0.8053
Weapon	0.9212
Vehicle	0.9358
Clothing	0.9373

Spearman rank order correlations were also calculated for each category norm of U.K. against U.S. rankings, see Table 7.1.3, above. It is clear that there are striking agreements and disagreements between U.K. and U.S. raters and this is briefly discussed below.

7.4 Discussion

The principle finding is one of close agreement between Ss as to the goodnes-of-example of a large number of exemplars across a group of categories. This supports Rosch's conclusions that "...(a) Subjects consider it a meaningful task to rate members of such categories according to how well they fit the subject's idea or image of the meaning of the category name and (b) there is high agreement between subjects concerning these rankings..." and therefore that the norms "...provide a reliable measure of internal structure...", [p.198-199]. Thus, following Rosch's example, these norms will form an independent variable in the research reported below which will employ subjects drawn from the same population from which the norms were collected. The independent variable will be typicality which will be employed to investigate hypotheses concerning the organization of autobiographical and semantic memories, as outlined in chapter 6.

A second finding, peripheral to the central aims of this thesis but of interest nevertheless, was that the extent of agreement betweeb U.K. and U.S. norms varied considerably across categories though overall agreement was high. In a comparison of production frequency category norms between U.K. and U.S. subjects Brown, [1978] found similar variations. Brown argues that these variations are partly attributable to the two national populations being exposed to different sets of referent objects. Some of these differences occur naturally as in the case of Birds and Vegetables, whereas others are culturally created as in the case of Sport and Toys. The correlations listed in Table 7.1.2 lend some support to these arguments. These findings also provide some indirect support for one of Roschs' 'principles of categorization' [1978; discussed in Chapter 4]. This principle staes that perceptual discontinuites, which vary from environment to environment, contribute to the structuring of groups of instances. However it is not intended to pursue this issue here.

The important implication of the national differences for the current research is that norms gathered from one population can not be readily applied to another population. The prediction that the overall form of typicality would be the same but that different items would be rated as more of less typical according to nationality was confirmed.

Experiment 2

Imagery Norms

7.5 Introduction

In this experiment data was collected from Ss about the rated imagability of a selection of exemplars drawn from the typicality norms compiled in Experiment 1. Two types of image were examined: [a] 'typical instance' imagery in which Ss were asked to rate the imagability of typical instances of exemplars and [b] 'personal instance' imagery in which Ss were asked to rate the imagablity of personal instances of the same exemplars. Typical instance images were assumed to be drawn from underlying semantic memories and personal instance images were assumed to be drawn from underlying autobiographical memories, [see chapter 3 and 4]. For the moment these assumptions will not be questioned further. However evidence will be presented [chapters 8 and 9] showing that such assumptions are warranted. The central purpose of this experiment was to examine whether the two classes of memory were equally imageble.

The first hypothesis, drawn from the general hypothesis of a content distinction between autobiographical and semantic memories, was that: as personal instance images would contain information about actors, actions and locations, and typical instance images would contain information about the perceptual attributes of the imaged item, personal instance images should be richer or more detailed than typical instance images. To assess this it was decided to ask Ss to rate the 'detail' with which images came to mind. It was predicted that there would be no correlation between ratings of 'detail' given to personal and typical instance images, indicating that the two were not associated.

A second hypothesis was simply that images drawn from one or the other class of memory would be more or less easy to bring to mind. It might be argued that autobiographical memories would be less easy to image than semantic memories because they contain more detail. There is some evidence that complex images take more time to generate and require more effort to keep in mind than simpler images [see Kosslyn, 1980]. However as there is no past work that has directly investigated differences in the availabilty of autobiographical and semantic memories it was only predicted that there would be differences in the rated ease with which images came to mind and the direction of the differences was not predicted.

A third issue related to the organization of the underlying memories [see chapter 6]. It was reasoned that as semantic memories are represented in categories then a typicality effect should be present in the typical instance imagery ratings, particularly on the ratings of 'ease' with which an image came to mind. It was hypothesised that ratings of ease of imaging an item would correlate with the rated typicality of that item, but only for typical instance imaging. As little was known about the underlying organization of autobiographical encodings no firm predictions could be made about the expected relationship of personal instance imagery and typicality. However, as discussed in chapter 6, various considerations suggested that autobiographical memories were not organized in terms of centrality of exemplars to a class. Therefore it was expected that personal instance imagery would not be related to typicality.

The three hypothese were; a] that personal instance images would be rated as being more detailed than typical instance images; b] that personal and typical instance images would differ in rated ease of imagability, although which type of image would be rated easier to image is not predicted; and c] that typical instance imagery would vary with rated typicality but that personal instance imagery would be unrelated to typicality.

7.6 Method

An independent groups design was employed. Ss were randomly allocated to one of two groups. One group were required to rate the imagability of typical instances of exemplars while the other group were required to rate the imagability of personal instances of the same items, [see

Procedure, below, for instructions]. In both groups two ratings were required for each item, [a] the 'ease' with which the image came to mind and [b] how 'detailed' or 'elaborate' the image was. In all cases Ss used a 7-point rating scale where '1' indicated very high imagery detail or ease and '7' indicated very low imagery detail and ease. The presentation of stimuli, and the order of ease and detail ratings, were randomized.

Subjects

106 Ss took part all were Open University students attending a weeks' residential introductory psychology summer school at the University of Sussex. They were 70 females and 36 males, with a mean age of 34, ranging from 23 to 51. All Ss were English speaking resident U.K. nationals.

Stimulus Selection

9 exemplars were selected from each of the 9 goodness-of-example category norms collected in experiment 1 [see Table 7.1.1., Appendix A] on the following basis: a] in each set of 9 exemplars, 3 exemplars were highly typical, 3 were mediumly typical, and 3 were atypical. Typical exemplars had a ranking of 6 or higher, mediumly typical exemplars had a ranking falling between 21 and 32, and atypical exemplars had a ranking of 40 or lower; b] exemplars from all levels of typicality were

only selected if they were unambiguous members of their superordinate category. So exemplars such as 'Glass' for the category 'Weapon', or 'Books' for the category 'Toy' were rejected; c] exemplars were chosen that could be represented by simple pictures and that were likely to have been frequently encountered by Ss in their everyday lives. So exemplars such as 'Oriole' for the category 'Bird', or 'Kale' for the category 'Vegetable', were rejected. 81 exemplars were selected and these are listed under their appropriate superordinate category in Table 7.2.1, below, [see Results].

Materials

A six page experimental booklet was constructed in which each printed exemplar was immediately followed by two 7-point rating scales, one labelled 'Ease', and the other labeled 'Detail'. The first page contained the instructions, the next four pages contained the 81 stimulus words, and the final page contained questions about age, sex, nationality, and language. The distribution of exemplars on the four centre pages was randomly selected from a group of twenty random orderings of the total set of 81 exemplars, 'Ease' and 'Detail' scales were randomly alternated, and the ordering of pages was selected randomly from the 4! possible page orderings. Thus although some Ss received either the exemplars or pages in similar orders no Ss received identical an overall presentations.

Procedure

Ss took part in groups of 20 and completed their ratings in their own time, in a large hall seated well apart. Ss were given the following instructions according to which group they were allocated, either [A] 'Personal instance' imagery raters, or [B] 'Typical instance' imagery raters.

[A] "This study has to do with how clearly and how easily certain words bring to mind images of objects and activities with which we are familiar. For example on hearing the word BICYCLE I have an image of my own, slightly rusty, bicycle parked in the hallway of my house. To take a more unusual example, in thinking about the bird TOUCAN I recall watching a T.V. advert that featured a Toucan.

<u>In this study you are asked to bring to mind images of actual objects and activities which you have experienced. That is you are asked to bring to mind, in the form of an image, a personal or autobiographical instance of the named object or acitvity</u>, [we shall refer to this, in the rest of these instructions, as a 'personal instance image'].

In the above two examples there are two important differences between my two images: firstly my image of my bicycle came almost immediately to mind whereas the image of a Toucan took some effort to bring to mind. I had to think about it. Thus some images come to mind more readily or with more ease than other images. One of the things you will be asked to do below is to indicate how easily certain images come to mind. Secondly my image of my bicycle contained quite alot of detail whereas my image of the Toucan was a bit hazy and contained only a few details. A second thing that you will be asked to do is to indicate how detailed certain images are once you have brought them to mind.

You are, then, asked to judge with what 'ease' your image came to mind and how 'detailed' that image was.

Over the page is a list of words and next to each word are two 7-point rating scales; an 'E' [ease]-scale and a 'D' [detail]-scale. You are asked to ring a number on the appropriate scale to indicate your judgment of how easily and with what detail, a specific word brings to mind a personal instance image of the named object or activity. For example:

BICYCLE E 1 2 3 4 5 6 7

D 1 2 3 4 5 6 7

TOUCAN D 1 2 3 4 5 6 7

E 1 2 3 4 5 6 7

E-SCALE: A '1' on the E-scale means that a personal instance image came immediately to mind. A '7' means that no personal instance image came to mind. A'4' indicates that a personal instance image came to mind only after some thought. Other numbers such as '2' and '3' indicate that personal instance images came to mind more or less easily, '5' and '6' indicate that personal instance images were elicited with more or less difficulty.

D-SCALE: A '1' on the D-scale means that an image of a detailed or an elaborate autobiographical, or personal instance, image came to mind. A '7' means that no personal instance image came to mind. A '4' indicates that a general or hazy personal instance image came to mind. Intermediate numbers such as '2' and '3' indicate that the personal instance image was more or less detailed, whereas '5' and '6' indicate that the personal instance image was more or less general or hazy. [Note that in the word lists the E-scale does NOT always occur before the D-scale: Check this carefully before ringing a number]

The numbers I have ringed in the above examples reflect my judgments of the the ease with which, and detail contained in, the personal instance images I was able to bring to mind in response to BICYCLE and TOUCAN. Try to make your ratings on the basis of the first image that comes to mind.

It is essential that you make your judgments, on the E- and D- scales, as fine as possible and you are asked to use the full range of numbers on the 7-point scales to achieve this. Of course everyone will give different ratings according to their experiences and preferences, so do not be concerned about whether your judgments are 'right': There are no right answers. Just mark it the way you see it.

Try to work as quickly as possible, 'though not so fast that your answers are ill-considered. Generally you will find that bringing to mind personal instance images of every day objects and activities is extremely easy."

[B] "This study has to do with how clearly and how easily certain words bring to mind images of typical instances of objects and activities. For example on hearing the word BICYCLE an image of bicycle comes readily to mind. However, to take a more unusual example, on hearing the word TOUCAN I had to think a little before I could bring an image to mind.

<u>You are asked to form images of 'typical instances' of different objects and activities. This means that you should generate images of what is typicaly meant or denoted by a particular word. For example it may be the case that you personally own a tandem bicycle and hence might find it easy to form an image of that bicycle. However, in this study, you are asked not do this but form an image of what most people would mean by the term bicycle. That is an image of what best fits your idea of the object</u>. [These will be referred to as 'typical instance images' throughout the rest of these instructions].

From the above examples it is clear that some images come to mind more readily or with more ease than other images. One of the things you will be asked to do below is to indicate how easily certain images come to mind. A second point is that while my image of 'bicycle' contained quite alot of detail my image of a toucan was a bit hazy and contained only a few details. A second thing that you will be asked to do, then, is to indicate how detailed certain images are once you have brought them to mind."

The remaining instructions were identical with [A] except that 'typical instance image' was substituted for 'personal instance image.

Ss were randomly allocated to one of the two groups by drawing either a blue or yellow token from a box. The lights in the hall were dimmed to encourage image generation and it was verbally suggested to Ss that they employ one of two techniques; [1] close eyes and try and see the image, [2] keep eyes open, fixate on a blank wall or 'the middle distance', and project the image.

7.7 Results

The mean ratings for 'ease' and 'detail' of imagability in the two instruction groups, 'typical instance' [TI] and 'personal instance' [PI] are listed in Table 7.2.1 [Appendix A] next to the actual exemplars and their corresponding typicality rating.

Two sets of random split-half correlations were calculated for each set of ratings [E-TI, D-TI, E-PI, D-PI]. Spearman rank correlations for 'Ease' and 'Detail' ratings under TI instructions were all higher than .886 and for 'Ease' and 'Detail' under PI instructions were all higher than .832, showing close inter-subject agreement.

All four sets of imagery ratings and the typicality ratings were entered into a stepwise multiple linear regression where the imagery ratings were the predictor or independent variables and the typicality norms were the criterion or dependent variable. Two separate regression analyses were undertaken and the predictors were entered in reverse order in the second analysis. Table 7.2.2, over, shows the correlation matrix of the variables.

The best predictor of typicality was E-TI with a multiple R of 0.4375 that accounted for 12.7 % of the variance of typicality and this was significant with $F=4.1125$ DF 1,79 $p<0.05$. No other variables accounted for more than 5 % of the typicality variance and none yielded significant F ratios. It thus seemed that 'ease' of imagability of typical instances was a weak [correlation was only 0.41] but comparatively significant predictor of typicality. PI imagery, on both ease and detail ratings, was the least predictive of typicality. PI ratings on both scales were slightly higher, see Table 7.1.1 [Appendix A], than TI ratings indicating that PI images were perceived as being slighty more difficult to bring to mind and slightly less detailed than TI images. However the highest correlations were for E-TI with D-TI and E-PI with D-PI, indicating that the two types of measure were closely associated.

Table 7.2.2 Correlation Coefficients for Imagery and Goodness-of-Example Ratings [Typicality].

	Typic- -ality	E-TI	D-TI	E-PI	D-PI
Typic- -ality	1.0000	-	-	-	-
E-TI	0.4127	1.0000	-	-	-
D-TI	0.3987	0.9024	1.0000	-	-
E-PI	0.2697	0.6552	0.6955	1.0000	-
D-PI	0.1758	0.5209	0.6158	0.8967	1.0000

Table 7.2.3 Correlation Coefficients for Imagery and Goodness-of-Example Ratings Collapsed across 'Ease' and 'Detail' Ratings.

	Typic- -ality	TI	PI
Typic- -ality	1.0000	-	-
TI	0.4063	1.0000	-
PI	0.2291	0.6673	1.0000

These high inter-correlations between E and D within TI and PI had the effect of rendering the F values reported unstable from analysis to analysis. It was found that both regression coefficients and other estimates of variance [RSQ, mean square correlation coefficients] varied with the order in which variables were entered into the regression equation. This was due to the multicollinearity of the variables and, in particular, to the extreme collinearity of the intercorelations of E-TI and D-TI [0.9024] and E-PI and D-PI [0.8967]. Multicollinearity renders the regression equation unstable, hence regression coefficients fluctuate from sample to sample, and reduce the reliability of the partial regression coefficients [Johnston, 1972]. As E and D ratings within the two instructions groups were so highly correlated and because of the effect this had upon the regression analysis it was decided to re-analyse the TI and PI ratings collapsed across the E and D measures. Table 7.2.3, above, shows the correlation matrix for the collapsed analysis.

TI and PI were entered into a multiple linear regression as predictors and typicality ratings were the criterion. The overall multiple R was 0.4132 and RSQ was 0.1707 . The overall regression yielded a F ratio of 8.028, DF 2, 78, which was significant $p<0.0006$. Two-tailed t tests performed on the regression coefficients found that, for TI $t=3.333$, which was significant, $p<0.001$, and for PI $t= -0.568$ which was not significant, $p<0.57$. Further TI, with a multiple R of 0.4102, accounted for 12 % of the variance on the dependent variable whereas PI, with a multiple R of 0.22915, accounted for only 5.3 % of the variance on the dependent variable. This finding supports the hypothesis that typical instance images are related to typicality whereas personal instance images are not related to typicality to any significant extent.

Also note that TI and PI were comparatively closely correlated with each other [0.6673] indicating an association between the two groups. As clearly this association is not related to typicality, it would seem reasonable to conclude that the relationship is one of imagability. In other words autobiographical and semantic memories were equally imagable.

In addition each category was analysed separately and the regression equations were tested for equality between groups. The analysis of variance of regression coefficients over groups yielded a F ratio of 1.922, DF 24, 54, $p<0.025$. Table 7.2.4 lists the regression coefficient, 't' statistic, and p level for TI and PI in each category. It can be seen from table 7.2.4, above, that the significant difference between regression coefficients over categories is a product of the correlation of TI with typicality and the lack of correlation of PI with typicality. However these effects were not consistent over categories.

Table 7.2.4 Regression Analysis Across Categories. Including Regression Coefficients, T Values, and p values (two-tailed).

Category	Variable	Coefficient	T	P(2-tailed)
Weapon	TI	0.54566	1.238	0.262
	PI	0.25826	0.557	0.598
Bird	TI	2.56232	4.198	0.006
	PI	-1.25296	-1.792	0.123
Vegetable	TI	3.84930	2.794	0.031
	PI	-3.02379	-2.293	0.062
Clothing	TI	5.54239	1.419	0.206
	PI	0.96149	0.475	0.652
Fruit	TI	2.96818	2.829	0.030
	PI	0.01793	0.013	0.990
Toy	TI	1.96030	1.608	0.159
	PI	-0.95196	-0.938	0.384
Vehicle	TI	2.24713	1.072	0.325
	PI	0.48519	0.367	0.726
Sport	TI	2.06098	0.451	0.668
	PI	-2.78183	-1.141	0.298
Furniture	TI	1.03371	0.707	0.506
	PI	1.27943	1.713	0.137

To investigate this further, linear trends amongst groups [TI and PI], categories, and the grouping of imagery ratings by typicality level, were tested. [Note that the actual typicality ratings were not included in this analysis]. All the main effects were significant, groups F 187.34, DF 1, 54, $p<0.001$, categories F 4.85, DF 8, 54, $p<0.001$, typicality F 25.1, DF 1, 54, $p<0.001$. Of interest in this case were two higher order interactions. The groups by category interaction was at significance, F 2.15, DF 8,54, $p=0.05$, and the groups by category by typicality interaction was also significant, F 2.377, DF 8, 54, $p<0.05$. No other interactions were significant. These findings indicated that typical instance image instructions produced ratings similar to those of typicality norms whereas personal instance image instructions produced ratings that were partly negatively correlated with typicality norms, although both these effects varied with categories.

In summary: some categories produced TI imagery ratings which were more or less postively correlated with typicality; some categories produced PI imagery ratings which were more or less negatively correlated with typicality. These two effects were, overall, significantly different from each other.

7.8 Discussion

The finding that judgments about how easily, and with what detail, images came to mind were highly correlated in both personal and typical instance imagery groups, indicated that these measures were closely associated. Because of the correlation the hypotheses that personal instance images would be rated as being more detailed than typical instance images and that one or the other class of imagery would be rated as being more or less easy to image could not be statistically assessed. The fact that the two rating scales within PI and TI were highly correlated indicated that they were ratings of the same thing, namely, imagability [c.f. Paivio, Yuille, and Madigan, 1968]. It seems that the detail contained in an image is one of the determinants of the ease with which that image can be brought to mind [c.f. Kosslyn, 1980; also discussed in chapter 5].

Nevertheless it was apparent from table 7.2.1 [Appendix A] that typical instance imagery ratings, of both ease and detail, were slightly higher than corresponding ratings of personal instance images, but these differnces were slight. Examination of Table 7.2.1 indicates that TI images were generally [but not always] rated 0.5 to 1 point higher [i.e. closer to 1] on the 7-point scale, for both ease and detail. Furthermore the two scales, ease and detail, when collapsed within imagery groups, yielded a moderate correlation [see Table 7.2.3 above] between PI and TI. Personal instance and typical instance images were, then, judged to be equally imagable and the hypotheses that the two types of imagery would be judged to be differently imagable were not confirmed.

The third hypothesis that ratings of typical instance imagery would be correlated with rated typicality received some support from the small but significant correlation between the two [see Table 7.2.3]. The TI correlation with typicality was nearly twice that of the PI correlation. It thus appeared that TI and PI ratings were not similarly related to typicality. Further analysis found that the positive correlation of TI with typicality was significant, that PI ratings were negatively correlated with typicality, and that these two effects were significantly different from each other. Finally it was observed that these effects varied from category to category.

These findings clearly showed that the rated imagability of typical instances of items were similar to the rated typicality of those items. This strongly suggests that TI imagery and typicality are in some way related. Possibly typical items are more available in memory, than less typical items, and hence were 'easier' to TI image. This proposal receives support from the research reviewed in chapter 4 [section 4.4] where it is reported that typical exemplars were easier to recall, image, make category judgments about, and were more frequently referred to in conversation. It was also clear from the findings that personal instance imagery ratings are not positively correlated with typicality. This lends some support to the hypotheses that autobiographical memories are not organized in terms of typicality.

However this pattern of findings was not consistent across categories. Although TI ratings were always positively correlated with typicality, they were not always significantly so. It seems that typicality and the imagability of typical instances are only partially related. A possible explanation is that since Ss received the stimuli in random order they may not have perceived their categorical nature. Possibly a category cue, by activating the category in memory, might have rendered the relationship of imagability and typicality more stable [this is explored further in chapter 9, experiment 5]. PI ratings on the other hand, were not always negatively correlated with typicality. One explanation for this may be that if it proves difficult to locate the appropriate autobiographical memory from which to generate an image then the memory search defaults to the appropriate, and presumably more easily located, semantic memory. However had such defaulting been frequent then a typicality effect similar to that observed in TI would have been evident. As PI was either negatively or only very slightly positively correlated with typicality it was reasonable to assume that semantic memories were infrequently defaulted to in this condition. Certainly it was clear that PI and typicality were infrequently related and this suggested that the underlying autobiographical memories were not organized in terms of typicality.

7.9 General Conclusions

Experiment 1 replicated Roschs' [1975] goodness-of-example norms and provided typicality norms appropriate to a U.K. population. Experiment 2 reported imagery ratings appropriate to a U.K. population and found that the rated imagability of personal and typical instance imagery were similar. This suggests that the two types of imagery were equally imagible.

Further it was found that typical instance imagery was related to typicality but that personal instance imagery was either negatively or only weakly related to typicality. This suggests that the underlying autobiographical and semantic memories, from which the images had been drawn, differed in terms of their organization.

The normative data gathered in these two experiments was to be used in the selection of stimuli in subsequent experiments.

CHAPTER 8

DESCRIPTIONS OF AUTOBIOGRAPHICAL AND SEMANTIC MEMORIES

This chapter reports an experiment that directly investigated the hypothesised content distinction between autobiographical and semantic memories. In this experiment Ss were required to generate personal or typical instance images and then to give short descriptions of their images. The main finding was that descriptions of personal instance images were dominated by information about the context in which an item had been experienced. Descriptions of typical instance images were dominated by information about the perceptual attributes of the imaged item. Thus the content hypothesis was supported and it was concluded that autobiographical memories represent information about the context in which an item was encountered whereas semantic memories represented information about the general perceptual attributes of an item.

Data was also gathered relating to organizational differences between the two classes of memory. This data indicated that autobiographical memories of common items may connect to semantic memories of the same items by way of semantic representations of information concerning the locations of those items.

Experiment 3

Autobiographical and Semantic Memory Content

Introduction

The central point made in part 1 of this thesis was that autobiographical and semantic memories were most likely to differ in terms of the information that they represented. Chapter 4 [sections 4.4, and 4.5] reviewed evidence showing that semantic memories of common objects contained information, primarily, about perceptual attributes of the represented item. These perceptual attributes had been found to be general or typical of the category of the item, e.g. attributes given to 'chair' were 'seat, arms, back, legs, etc.,' [Rosch and Mervis, 1975; Ashcraft, 1978]. In contrast chapter 3 proposed that autobiographical memories contained information, primarily, about the context in which an item had been experienced. The point was also made that perceptual attributes contained in autobiographical memories would be specific to the experienced item, e.g. 'chair' would contain attributes such as 'green, worn, stain on arm,' and the like.

It was decided, then, to collect Ss descriptions of personal and typical instance images. The prediction was that the descriptions would differ in terms of their content; descriptions of personal instance images would contain information about the context in which the item had been experienced and information specific to the imaged object; whereas descriptions of typical instance images would contain information about general perceptual attributes of the imaged item.

In chapter 4 it was observed that previous researchers had investigated the role of perceptual attributes generally. Murphy and Smith [1982] reported that attribute overlap amongst basic level concepts was in terms of perceptual attributes rather than other classes of attributes. More recently Hemenway [1981] found that basic level objects had more parts in common than they had other perceptual attributes. In the present study it was decided to sub-divide perceptual attributes into features, properties, parts, and functions. The first three sub-groupings were discussed in chapter 4 and all are detailed below, [see Results]. However the inclusion of 'functions' as a sub-grouping of perceptual attributes may appear strange. Afterall functions and perceptual attributes have been singled out by past researchers as separate attribute groupings [see for example Nelson, 1974]. Yet 'functions' are generally comprised of what Rosch et al [1976(a)] called simple motor interactions. For example a function of 'chair' is that it can be 'sat on', a function of 'jacket' is that it can be 'worn'. As functions may largely be represented by simple motor interactions which might be thought of as being perceptual in nature it was decided to include functions as a sub-grouping of perceptual attributes. However it was not expected that functions would be freqently named by Ss in descriptions of their images. The image itself should not typically depict functions although the image might in some way <u>symbolize</u> functions of the item.

A similar fourfold sub-division of contextual attributes was suggested by the discussion of context in chapter 3 and by the discussion of the semantic representation of scripts in chapter 4. It was decided to divide contextual attributes into information about the experienced context [location], time, actors and activities [other than functions] and context specific perceptual information. These are detailed below [see Results]. This divison of contextual attributes was, in essence, a condensed version of Brown and Kulik's 'canonical' categories of recall [see chapter 3].

The divisions of perceptual and contextual attributes were not intended to be exhaustive of possible divisions that could be made of these attribute classes. Rather the aim was simply to provide some way of assessing the dominant attribute types named in Ss descriptions of their images. The reason that this was deemed neccessary was that in later experiments it was intended to manipulate the content of autobiographical and semantic memories. These divisions also facilitated the refinement of the content hypothesis. It was predicted that more perceptual parts would be named in Ss descriptions of typical instance images than other types of perceptual attributes [Hemenway, 1981]. Tulving's [1972, 1983] claim that episodic memories contain spatio-temporal information suggested that information about times and locations would dominate contextual attributes contained in Ss personal instance image descriptions.

In addition to investigating the content hypothesis the experiment aimed to examine attribute overlap between the image descriptions. This was to be achieved by employing groups of highly typical and atypical exemplars. It was shown in chapter 4 that semantic representations of highly typical basic level exemplars had many [perceptual] attributes in common with each other and had little overlap with exemplars from other classes. Atypical exemplars had few attributes in common with each other and overlapped considerably with exemplars from other classes. Similarly highly typical but not atypical exemplars contained [perceptual] attributes that were common to the category superordinate. Rosch and Mervis [1975] had Ss list attributes of highly typical and atypical exemplars and made a count of the number of attributes common to the five most typical exemplars and tc the five least exemplars. Table 8.1.1, over page, shows Rosch and Mervis' findings. In contrast, category superordinates were found to have virtually no attribute overlap with each other. The question then was, would descriptions of personal instance imagery contain attributes that overlapped with each other in a manner similar to that found by Rosch and Mervis for semantic representations ?.

A finding which bears on this question is that of Tversky and Hemenway [1982] who reported evidence that categories of environmental scenes containing information about locations were structured hierarchically in terms of attribute overlap in a manner similar to that observed by Rosch and Mervis. As attribute overlap is often taken as indicating semantic structure [Ashcraft, 1978; Rosch, 1975; Smith and Medin, 1981] it might reasonably be argued that information about locations is semantically represented. Thus autobiographical memories in as much as they contain information about locations may exhibt a form of attribute overlap similar to that of semantic memories. This suggests at least two plausible possibilities concerning attribute overlap between autobiographical memories: a] locational information may comprise the semantic content of autobiographical memories [see chapter 2]; b] locational

Table 8.1.1 Number of Attributes in Common to Five Most and Five Least Prototypical Members of Six Categories.

Category	Most Typical Members	Least Typical Members
Furniture	13	2
Vehicle	36	2
Fruit	16	0
Weapon	9	0
Vegetable	3	0
Clothing	21	0

[from Rosch and Mervis, 1975; Table 2, p582] information contained in autobiographical memories may be context specific but connect to semantic representations [of locations]. A corollary of a] is that autobiographical memories because they contain semantic information are not fully distinct from semantic memories and are organized in a similar manner. In contrast a corollary of b] is that autobiographical memories are separate from semantic memories but connect to them by way of information about locations and therefore are not neccesarily organized in a way similar to that of semantic memories but may be accessed by way of semantic memories. Although these two possibilities will not be directly investigated in the present experiment findings indirectly bearing on them will be reported. Subsequent experiments will more directly investigate organizational differences between the two classes of memory [c.f. chapters 9 and 10]. [Also, as will be recalled, it was stated in the research aims specified in chapter 6 that investigating connections between the two classes of memory was considered to be of secondary importance to investigating content and organizational differences. Thus it is not until in chapter 11 that experiments directly bearing upon this issue are reported].

Finally it is not expected that in the present experiment, other types of contextual attribute, e.g. context specific perceptual attributes, information about actors and actions, and temporal information, will exhibit such overlap.

The central hypothesis was that autobiographical memories would be found to predominantly contain contextual information whereas semantic memories would be found to predominantly contain perceptual information. A secondary hypothesis was that semantic memories would be found to exhibit a type of perceptual attribute overlap very similar to that observed by Rosch and Mervis [1975]. Related to this it was more tentatively predicted that autobiographical memories would be found to exhibit some contextual attribute overlap, similar to the predicted perceptual attribute overlap, but only for locational attributes. This would suggest that information concerning locations either comprises part of the semantic content of autobiographical memories or connects directly to semantic representations of locations.

Method

A between groups design was employed where Ss were randomly assigned to one of two groups, PI and TI. The PI group were required to generate personal instance images and the TI group were required to generate typical instance images. The stimuli were either highly typical [HT] or highly atypical [HA] of the three noun categories Furniture, Fruit, and Clothing. Immediately after generating an image Ss wrote a short description of their image. The dependent variable was the frequency with which attributes in the descriptions could be classified as contextual or perceptual.

Subjects

Subjects were 24 members of the Open University's administrative staff. There were 16 females and 8 males. Average age was 26. None of the Ss had ever taken part in a psychology experiment before. All were native English speakers.

Stimulus Selection

5 exemplars were selected from the 8 most typical exemplars and a further 5 from the 15 most atypical exemplars of the categories Furniture, Fruit, and Clothing. These exemplars were taken from the goodness-of-example norms reported in experiment 1 [Chapter 3, see Appendix A]. A complete list of the stimulus set items is contained in Table 8.1.1 in Appendix B. The three superordinate categories had been randomly selected from the group, Bird, Sport, Vegetable, Toy, Vehicle, Weapon. The superordinates were also included in the stimulus set. Thus 33 items were employed.

The stimulus selection criteria were identical to those employed in experiment 3. Some attempt was made to control for imagability of the stimuli in the following manner: PI and TI imagery ratings reported in experiment 2 [chapter 1, see Table 7.2.1, Appendix B] were consulted and exemplars were selected if they had similar PI and TI ratings. From the resulting set exemplars were selected that, within a category and within a typicality level, yielded mean rating values similar to the mean ratings from typicality levels within the corresponding two categories. Sets of atypical exemplars were slightly less imagable than highly typical exemplars. However this procedure could not be applied to all the stimuli because imagability ratings had only been collect for 3 exemplars at each typicality level. Stimuli the imagability of which were not know were selected because it was felt that they would be easy to image in both TI and PI.

Materials

All the basic level category exemplars were printed on individual pages in a booklet in 24 different random orderings of pages. Each page was half A4 size and the exemplar was printed at the top of the page. A further identical booklet was constructed containing the three superordinates. For the superordinates there were four identical page orderings of the 3! possible orderings.

Apparatus

Ss were provided with a pen and were timed with a stopwatch.

Procedure

Ss took part in groups of four in a large room. They were seated well apart and the light in the room was dimmed. Ss could easily see to write. Ss were then randomly allocated to one of the two experimental groups, PI [personal instance imagers] or TI [typical instance imagers]. According to their group Ss were given one of two sets of instructions.

PI: "This is a very simple experiment designed to collect information about the content of images that we can bring to mind of familiar everyday objects. On each page of the booklet in front of you is printed a word naming a familiar every day object. Your task is to bring to mind an image of that object as you have personally experienced the object. For instance if one of the objects was Bicycle you would bring to mind, say, an image of your own Bicycle or that of a friend. Having got the image clear in your mind's eye write a brief description of the image in the space below the word in the booklet. Brief notes will suffice. Here is an example of a description of Potatoes, that some one gave in a previous experiment: "I have an image of some potatoes [5lbs] in a plastic bag on the vegetable shelf at Waitrose". You will be allowed 45 seconds in which to bring to mind your image and write a brief description. The experimenter will then say "Rest" and there will be a 15 second pause. He will then say "Start" and you must turn to the next word and repeat the whole procedure. There are 45 words in all. If you can not bring an image to mind then score a line through that page and go on to the next word when the experimenter next says "Start".

TI. "This is a very simple experiment designed to collect information about the content of images that we can bring to mind of familiar everyday objects. On each page of the booklet in front of you is printed a word naming a familiar every day object. Your task is to bring to mind an image of a typical instance of that object, that is an image which best fits your idea of the object. For instance if one of the objects was Bicycle you would bring to mind an image of a typical instance of a bicycle, say, drop handle bars, two wheels, seat, brakes, basket, etc. Having got the image clear in your mind's eye write a brief description of the image in the space below the word in the booklet. Brief notes will suffice. Here is an example of a description of a typical instance of Potatoes, that some one gave in a previous experiment: "I have an image of some potatoes they are round and lumpy and are whiteish with some very dark spots on them" You will be allowed 45 seconds in which to bring to mind your image and write a brief description. The experimenter will then say "Rest" and there will be a 15 second pause. He will then say "Start" and you must turn to the next word and repeat the whole procedure. There are 45 words in all. If you can not bring an image to mind then score a line through that page and go on to the next word when the experimenter next says "Start".

[Note that the descriptions of 'potatoes', employed in both sets of instructions, were taken literally from descriptions given by Ss in a pilot study]

This part of the experiment took 50 minutes. Ss then reread their instructions and were verbally instructed that "the items which you are asked to image this time are slightly more abstract than the previous items, nevertheless you will find them easy to image". Ss then completed the booklet containing the three superordinates. The whole experiment lasted about 1 hour and Ss were paid one pound fifty pence.

Results

The results are in four sections containing: 1] the system of scoring the descriptions; 2] the analysis of descriptions given to basic level exemplars; 3] the analysis of descriptions given to superordinates; 4] overlap of the two sets of descriptions.

1] Scoring The Descriptions

The following attribute classification system was adopted [see Introduction, above, for discussion] : The contents of each description were entered in one or more of ten attributes classes; Locations, Times, Perceptual Idiosyncracies, Actors/Actions, Perceptual Properties, Perceptual Features, Parts, Functions, Exemplars, Other. The attribute classes Locations, Times, Perceptual Idiosyncracies and Actors/Actions, represented contextual attributes whereas the attribute classes Perceptual Properties, Perceptual Features, and Functions, represented perceptual attributes. The two additional classes, Exemplars and Other, were included to represent Ss who simply provided a name as a description [e.g. "I have an image of a Chair"] and Ss who included information other than contextual or perceptual [e.g. "I have an image of a very expensive chair"]. Thus a description such as " green chair in the front room at home" had two entries in Locations [front room, home] and one entry in Perceptual Idiosychracies [green]. Note that " Chair " is not counted in the Exemplar class because in this instance the exemplar is deemed to be part of the description of a perceptual idiosyncracy. In contrast a description such as "hard, wooden, legs, back, armrests" has one entry in Perceptual Property [hard], one entry in Perceptual Feature [wooden], and three entries in Perceptual Part [legs, back, armrest]. Appendix B contains examples of actual descriptions and their classification, [see also Results, below]. In cases where no clear classification was possible the attribute was counted in the class Other.

2] Basic Level Descriptions

The data were scored in accordance with the classification procedure previously outlined. To determine whether the data could be collapsed across categories and typicality levels the following within groups analysis was undertaken:

Within PI and TI 3 chi square analyses were performed on the total number of attributes contained in the descriptions regardless of attribute classification. A 12 by 2 Subjects by Typicality chi square, a 12 by 3 Subjects by Category chi square, and a 10 by 3 Typicality by Category chi square, were carried out. None of the six chi squares produced any significant chi values in either PI or TI.

It was concluded that the number of attributes given in the descriptions within groups was, approximately, the same at all levels of typicality and in all categories. Accordingly the data was pooled, within groups and across typicality levels and categories.

To determine the degree of concordance between Ss regarding the classification of the attributes in their descriptions the following analysis was undertaken:

The total number of attributes reported by a subject in any one description were summed within the classification under which they had been entered. S1's [PI] distribution of attributes is shown, below, in Table 8.1.2.

Within groups each S's classified attributes were entered in the Kendall coefficient of concordance [Siegel, 1956; p229-238]. In PI a W of .7706 was found that yielded a Chi of 67.8128, DF=11, which was highly significant, $p< 0.001$, indicating a high level of concordance in the classification of Ss descriptions within PI. In TI a W of .86 was found that yielded a Chi of 75.68 which was highly significant $p< 0.001$., indicating a high level of concordance in the classification of Ss descriptions within TI. Finally PI was compared with TI and a W of .0029 was found which was not significant and indicated little or no concordance between the classification of Ss descriptions between PI and TI. Given the close agreement within groups as to the classfication of descriptions it was decided to collapse together the relevant categories for each group. For PI L, T, PI, and A, were summed to form one category Contextual. For TI PP, PF, PPA, and F, were summed to form one category Perceptual. Table 8.1.3, over, shows the total classified attributes before they were collapsed.

[Note that as the category EX [exemplar] was little used in both groups it was decided to collapse O and EX together.]

A 2 by 3, Groups by Classification, Chi square was performed and this is shown in Table 8.1.4 below. A highly significant Chi value was obtained, Chi= 2164.38, DF=2, $p< 0.000$, showing that overall PI descriptions contained contextual attributes whereas TI descriptions contained perceptual attributes. Note that all between group cell totals in Table 8.1.4 differ significantly from each other.

In PI Ss had an overall mean 106.5 attributes ranging from 82 to 117 with a standard deviation of 10.644. In PI a mean of 3.55 attributes were contained in each description of an item with a range of 2 to 7 and a standard deviation of 1.14. For TI Ss named more atributes, mean=138 with a range of 110 to 160 and S.D. of 16.26. In TI a mean of 4.6 attributes were contained in each description of an item with a range of 2 to 8 and S.D. of 1.18.

Lastly a simple count was made of the attributes common to the five most typical items of a category [see Rosch and Mervis, 1975; p582] and to the five least typical items. An attribute was counted if it was named to four, or more, of the five exemplars. Table 8.1.5 shows the number of attributes.

Table 8.1.2 Example of Classification Of Attributes Taken From Subject 1 [PI].

	L	T	PI	A	PP	PF	PPA	F	EX	O
	<---CATEGORIES--->									
TOTAL ATTRIBUTES S1	48	8	30	7	0	0	0	1	0	11

[L=locations, T=time, PI=perceptual idiosycracies, PP=perceptual property, PF=perceptual feature, PPA=perceptual part, F=function, EX=exemplar, O=other]

Table 8.1.3 Classified Attribute Totals For PI and TI Exemplars.

	CONTEXTUAL ATTRIBUTES				PERCEPTUAL ATTRIBUTES					
	L	T	PI	A	PP	PF	PPA	F	EX	O
PI	610	123	271	125	8	12	42	21	4	62
TI	8	6	2	20	47	860	628	74	2	9

[L=locations, T=time, PI=perceptual idiosycracies, PP=perceptual property, PF=perceptual feature, PPA=perceptual part, F=function, EX=exemplar, O=other]

Table 8.1.4 Classified Attributes Totals Given in Descriptions of Personal and Typical Instance Images To Basic Level Exemplars.

	CONTEXTUAL	PERCEPTUAL	OTHER
PI	1129	83	66
TI	36	1609	11

Table 8.1.5 Number of Attributes, Contained in Descriptions of Personal and Typical Instance Images, Common to Five Highly Typical and Five Atypical Members of 3 Categories.

Part 1] Personal Instance Imagers

Category	Highly Typical Members	Atypical Members
Furniture	11	2
Fruit	9	3
Clothing	16	3

Part 2] Typical Instance Imagers

Category	Highly Typical Members	Atypical Members
Furniture	14	0
Fruit	11	2
Clothing	13	0

The following count revealed that: Of the total of 32 overlapping attributes for PI 27 were locations, 3 were actors/actions, and 2 were times. All the overlapping attributes to atypical exemplars were locations: Of the total of 40 overlapping attributes for TI 23 were perceptual features and properties, and 17 were perceptual parts.

3] Superordinate Descriptions

Exactly the same analysis was carried out on the superordinate descriptions to determine whether attribute totals could be summed across Ss, typicality, and categories. No significant Chi squares were observed and it was concluded that Ss, within an instruction group included the same number of attributes in their descriptions regardless of category and typicality level. Attribute totals were collapsed across Ss, categories, typicality levels.

Ss classified descriptions were analysed using Kendall's coefficient of concordance. PI produced a W of .8134 that yeilded a Chi of 87.73 which, with DF=11, was highly significant, p< 0.001, indicating a high level of concordance between Ss classified descriptions. TI produced a W of .701 which yeilded a Chi of 75.7 which, whith DF=11, was highly significant, p< 0.001, indicating a high level of concordance between Ss classified descriptions within TI. When compared with each other a W of .0041 was obtained which was not significant indicating little or no concordance between the classification of PI and TI descriptions. Within groups the classification were collapsed into Contextual and Perceptual as had previously been done for the basic level descriptions. Note that O and EX were not collapsed together in this instance because extensive use was made of EX in both groups [see below]. Table 8.1.6, below, shows the classified attribute totals.

The two groups classified descriptions were analysed in a 2 by 4 Chi square which is depicted in Table 8.1.7 below.

The difference in classification of description between the two groups was highly significant with Chi=512.71, DF=3, p< 0.000, indicating that PI descriptions contained contextual information whereas TI descriptions contained perceptual information. In the PI group Ss descriptions contained, on average per item, 9.11 attributes ranging from 6 to 14 per superordinate with a S.D. of 1.89. Ss descriptions in the PI group contained, on average, 27.33 attributes per S over all superordinates, ranging from 20 to 34, with an S.D. of 4.25. In the TI group Ss descriptions contained, on average, 8.69 attributes ranging from 6 to 14 per superordinate with a S.D. of 2.27. Ss descriptions in the TI group contained, on average, 26.08 attributes per S overall superordinates, ranging from 16 to 36, with an S.D. of 4.99. This indicated that the number of attributes contained in a description, either by subjects or by

Table 8.1.6 Classified Attribute Totals For PI and TI Given to Superordinates.

	CONTEXTUAL ATTRIBUTES				PERCEPTUAL ATTRIBUTES					
	L	T	PI	A	PP	PF	PPA	F	EX	O
PI	96	17	27	14	3	9	2	3	106	51
TI	0	0	0	0	11	141	108	6	47	0

[L=locations, T=time, PI=perceptual idiosycracies, PP=perceptual property, PF=perceptual feature, PPA=perceptual part, F=function, EX=exemplar, O=other]

Table 8.1.7 Classified Attributes Totals Given in Descriptions of Personal and Typical Instance Images To Superordinate Categories.

	CONTEXTUAL	PERCEPTUAL	EXEMPLAR	OTHER
PI	154	17	106	51
TI	0	266	47	0

Table 8.1.8 Number of Attributes Common to Descriptions of Personal and Typical Instance Images of Five Highly Typical and Five Atypical Category Members and their Superordinates for 3 Categories.

Part 1] Personal Instance Imagers

Category	Highly Typical Members	Atypical Members
Furniture	5	2
Fruit	4	2
Clothing	4	1

Part 2] Typical Instance Imagers

Category	Highly Typical Members	Atypical Members
Furniture	11	0
Fruit	8	0
Clothing	9	0

items, were virtually identical for both PI and TI. There were was no feature overlap between superordinate.

4] Overlap Between Superordinates and their Basic Level Exemplars.

A simple count was conducted to examine the attributes that the five highly typical exemplars and the five atypical exemplars had in common with their superordinate in the different imagery groups. Only the attributes which had already been found to be common to the exemplars were included in this count. Table 8.1.8, above, depicts the number of common attributes. For PI the 18 common attributes were all locations. For the TI group the 28 common attributes were 18 perceptual features and 10 perceptual parts.

Discussion

The hypothesis that descriptions of typical instance images would be dominated by perceptual information whereas descriptions of personal instance images would be dominated by contextual information was strongly supported. In the following discussion the findings are considered in two separate groupings; a] findings relating to descriptions of exemplars; and b] findings relating to descriptions of superordinates. In a third section implications of both sets of findings are jointly discussed. However before turning to this discussion a general criticism relating to the experiment as a whole will be briefly considered.

It may be recalled that Neisser [1982] criticised the Brown and Kulik experiment on the grounds that their findings may have been the product of narrative conventions rather than 'canonical categories' of recall [chapter 3]. Although Neisser's criticism was dismissed in chapter 3 the possibility still remains that, in the present experiment, Ss descriptions may have been partly or wholly determined by the type of descriptions which Ss thought were expected of them. For instance the examples contained in the instructions may have led some, or all, the Ss to recount descriptions of a like content even though these were not accurate descriptions of their images. Yet, as will become evident below, the nature of Ss descriptions strongly indicated that they were describing images drawn from autobiographical or semantic memories. Moreover in chapters 9 and 10 experimental evidence that does not rely on Ss' descriptions of images is reported which further confirms that it is the images, and not their descriptions, which differ. A a more complete refutation of this criticism will then, be deferred until these later chapters.

Descriptions of Images of Exemplars

Descriptions of typical instance images predominantly contained information about the perceptual features, parts, and properties, of objects, in that order [see Table 8.1.3, above]. This finding concurs with the results of Murphy and Smith [1981] and Hemenway [1981], who found that attribute lists given to basic level exemplars were predominatly comprised of perceptual attributes. Hemenway [1981] further reported that perceptual parts were particularly frequently emitted in response to such exemplars. However, it can be seen from Table 8.1.3, that perceptual parts were second to perceptual features in terms of production frequency. This discrepancy may have been specifically related to the experimental manipulation in which the attributes were collected from descriptions of images. It would seem natural that fewer parts would be recorded in this case because, in many instances, such attributes would not be directly contained in the image itself. For example 'pips' were not mentioned [in TI] in any of the descriptions of Apple presumably because the actual images which Ss described did not depict Apple seeds. This also, albeit indirectly, indicates that Ss were describing actual images rather than, say, simply listing attributes or constructing a description of what they thought was expected.

Overall the general charater of TI image descriptions strongly indicated that Ss had imaged isolated objects [i.e. not set in any context] which were typical of a class of objects and which contained primarily perceptual attributes.

By way of contrast PI imagery descriptions were dominated by contextual attributes about locations, perceptual idiosyncracies, actors/actions, and times [in that order]. Perceptual idiosyncracies suggested that Ss were describing an actual personal image and were concerned to separate out that image from other possible images. Personal instance imagery also gave rise to descriptions that contained mcre information which was only classifiable as 'Other' than did typical instance imagery. Attributes entered in the class 'Other' tended to be non-perceptual, non-contextual, and distinctive. Take, for example the following description of a personal image of a radio "melted white clock-radio on top of grill in kitchen, an accident" . The term 'accident' would seem not to be literally contained in the image but to be a label for that image. It may be recalled that Whitten and Leonard [1981; see Chapter 3 section 3.2] in their study of the protocols of Ss recalling teachers found that a common recall strategy was to bring to mind a distinctive episode from a temporally close period to one in which the S had been taught in a particular grade and/or a particular subject and then to search from this memory location. Perceptually idiosyncratic and other distinctive information in the present experiment may then, similarly act to maintain the distinctiveness of the memory trace and thus facilitate retrieval [c.f experiment 8, chapter 10, and also chapter 12].

Overall the general character of PI image descriptions strongly indicated that Ss had imaged objects which they had experienced in the contexts in which they had been encountered. These image descriptions suggested that Ss had brought to mind a 'scene' or episode in which the target item had been prominant [as in the clock example above].

Thus, as predicted, the two types of imagery contained different information supporting the hypothesis that the underlying autobiographical and semantic memories from which the images had been generated, represented different types of information.

Attribute overlap in the descriptions of TI imagers was similar to the type of attribute overlap previously described in the literature [Rosch and Mervis, 1975; Ashcraft, 1976; Hemenway, 1981]. Perceptual features and properties accounted for 57.5% of the total of overlapping attributes in part 2 of Table 5.1.4 and perceptual parts accounted for 42.5% of this total. These findings were as predicted and lent further support to the general model of categorization outlined at the close of chapter 4.

In contrast PI attribute overlap was comprised almost exclusively of locational attribute overlap; 83.5% of all the attribute overlap in section 1 of table 8.1.5 is accounted for by commonality of locations and this rises to a 100% for atypical items. It would thus seem that the locative information contained in autobiographical memories is, as predicted, organized in a manner similar to that prevoiusly found for perceptual attributes in semantic categories. However locational attributes comprise less than 35% of all the attributes named in PI image descriptions and so it is not the case that the majority of the information contained in autobiographical memories overlaps in the same way as information in semantic memories. This tentatively suggests that autobiographical memories are not organized in semantic categories and that locational attributes may be more closely associated with semantic memory than other attributes types contained in autobiographical memories. These points will be returned to in the final section of this discussion.

It was also noted, in the process of analysis, that many of the PI descriptions were descriptions of objects in S's everyday environment(s). However 'times' were only infrequently mentioned in Ss PI descriptions. One of the reason for this may have been that time was an emergent property of the image. In other words the time associated with the image was specified indirectly in the image e.g. by the image depicting an experienced object during daylight hours, at a meal time [breakfast]. Nevertheless it could more simply be the case that autobiographical memories of common ojects and activities do not contain explicit information about the time an item was encountered. To examine this a count was made of all descriptions which the experimenter, felt, indicated that the item had been encountered recently. This was done whether or not a specific time was mentioned in the description. For instance it was assumed that if a description was of an object in an S's home or work environment then that object could have been encountered recently. Clearly such a count was only possible for PI descriptions. The result was that 82% of the descriptions given in PI were descriptions of items that would have been encountered recently and frequently by Ss and this recency effect was equally distributed between typical [39.5%] and atypical [42.5%] exemplars. This, admittedly post hoc, analysis lends some tentative support to the contention that 'time' is implicit in images generated from autobiographical memories. Further this finding supports the discussion of the recency of autobiographical memories contained in chapter 3 [see especially the discussion of Linton's research, where it was observed that autobiographical memories had been found to be subject to strong receny effects].

Descriptions of Images of Superordinates

Descriptions of superordinates produced a pattern of findings similar to that observed for exemplars. PI superordinate descriptions contained predominantly contextual attributes whereas TI superordinate descriptions contained predominatly perceptual attributes. The classification of contextual and perceptual attributes followed a pattern very similar to the one found for exemplars. Perceptual attributes were dominated by perceptual features and parts whereas contextual attributes were dominated chiefly by locations and, to a lesser extent, perceptual idiosyncracies. Also PI superordinate descriptions contained unclassified information similar to that discussed in connection with exemplars. Thus the attribute content of superordinate descriptions was very similar to the attribute content of descriptions of exemplars.

However before going on to discuss attribute overlap between exemplars and superordinates it should be noted that it was found that both TI and PI descriptions contained exemplars, which had not been the case at the basic level. Indeed exemplars were the most frequently classed items in PI superordinate descriptions. Thus the character of PI images of superordinates generally took the form of a group of objects in a common location. Consider for example the following description of a PI image of Furniture, "In the living room, there's a dinning table and chairs, a three piece suite, a T.V., a wall unit with display cabinet". In contrast a parallel TI description contained no mention of context and exemplars were only occassionaly mentioned, e.g. "Wooden objects with flat surfaces, hard edges, angular, legs, various shades of brown, largish, table, couch". The images generated in TI of superordinates would seem to contain some typical group of objects that depict perceptual information common to the central members of the class. In contrast the images generated in PI depicted actual experiences of groups of objects in common locations.

[Note also that in the PI group a post hoc assessment, identical to that carried out for exemplars, found that 92% of PI images were judged to have been drawn from recent experiences, e.g. visting shops, home, and work].

A count was made of the overlap of common exemplar attributes with superordinate attributes, see Table 8.1.8, above. In the case of perceptual attributes the overlap pattern was as predicted with typical exemplars exhibiting considerable overlap with their superordinates and atypical exemplars showing no overlap, [64.3% of the overlapping attributes were perceptual features and 35.7% were perceptual parts].

However in the case of contextual attributes only locative attributes overlapped with the superordinate attributes. Overlap between typical exemplars and the superordinate was low. There was some [even lower] overlap between locational attributes given to atypical exemplars and superordinate locational attributes, see Table 8.1.8., above. This comparatively reduced overlap between locational attributes given to typical exemplars and their superordinates [in PI descritions] has a simple explanation: PI descriptions of superordinates tended to include superordinate locations, e.g. Clothing, "In shop window in city centre", whereas PI descriptions of exemplars tended to contain basic level locations [Tversky and Hemenway, 1983], e.g. Shirt, "On a hanger, on a rack, with lots of other shirts, in John Kents', [a local clothing shop]". Thus exact attribute overlap was reduced in the PI condition despite the fact that locations named as parts of descriptions of images of superordinates usually subsumed the locations named in descriptions of images of exemplars. Note that in TI descriptions there was no clear difference in the level of generallity of perceptual attributes named in descriptons of images of either superordinates or exemplars. It is clear then that only locative attributes overlap in a manner similar to that of perceptual attributes. The pattern of overlapping between superordinate and exemplars is not as marked for locative attributes as for perceptual attributes and this is similar to the finding of locational attribute overlap amongst exemplars.

If it is accepted that attribute overlap indicates semantic representation then it might be argued that locational attributes are represented semantically. However the locational attributes given by Ss in their PI descriptions were highly context specific which is not what would be expected of semantic representations. One plausible explanation for this is as follows: information about locations is represented in both autobiographical and semantic memories; in autobiographical memories locational information is specific to the represented scene, in semantic memories locational information is of a more general nature. Locational information in autobiographical memories may then act as a link to semantic representations of locations. One reason why locational attributes rather than other attributes may act as a link between the two memory classes is that locations even when context specific are less idiosyncratic than other types of attribute. For example the attribute 'pink' in the descritpion 'pink plastic table standing in a shop window' is more idiosyncratic of 'table' than is 'shop window'. Thus because information about locations contained in autobiographical memories is less idiosyncratic than other type of information then autobiographical locational information connects more directly to corresponding semantic locational information. These suggestions are returned to in later chapters [particularly in chapter 10] where subsequent findings bearing on them are reported.

This line of argument also suggests why locational attributes contained in autobiographical memories exhibited a type of attribute overalp previously found to be closely associated with semantic memories: S's memory search may have commenced by accessing semantic information about where [in what location] an item was most likely to have been encountered and activation spreading from this point would, presumably, have connected fairly directly to an appropriate autobiographical memory. Thus autobiographical memories may have been accessed by way of semantic information about locations. Semantic representation of locations because they are organized in terms of overlap would have channeled the search to autobiographical memories which exhibited similar locational attribute overlap. For instance a subject asked to generate a PI image of a 'Table' might activate semantic information about common locations for tables such as 'Kitchen', 'Dinning room', 'Office', the memory search spreading out from these semantic representation would activate closely connected autobiographical memories.

Given that locations may be represented semantically the question then arises as to what form this representation takes. As locational attributes were not named in TI image descriptions it seems reasonable to suggest that semantic representations of locations are separate from semantic categories. Yet the findings from the present experiment indicate that locations may overlap with each other suggesting that information about locations may be clustered together in some way. The findings of Bower and his colleagues [reviewed in chapter 4] found that information about locations may be represented in scripts. Thus a plausible but speculative proposal is that locations are clustered around or represented in, script-like semantic memories. A corollary of this line of reasoning is that autobiographical memories do not connect directly to their corresponding semantic memories. It was observed previously [chapter 4] that script-like semantic memories have been found to point to semantic categories, thus autobiographical and semantic memories of the same item may connect only indirectly to each other by way of script-like semantic representations: these issues are considered in more depth in chapters 10 and 11. Also a further suggestion implicit in the above discussion, that autobiographical memories may act as instantiations of scripts much as exemplars act as instaniations of categories, is considered in detail in chapter 12.

Conclusions

The central finding of experiment 3 was that semantic memories contained information about the perceptual properties, features, and parts of objects. In contrast autobiographical memories contained information about context and in particular information about locations, perceptual idiosyncracies, times, and actors/actions, associated with actual experiences. Thus the hypothesised content distinction was confirmed. It is concluded that semantic and autobiographical memories represent different classes of information.

A subsiduary finding was that perceptual attribute overlap exhibited a pattern similar to that previously found: typical exemplars shared attributes with each other and with the superordinate whereas atypical exemplars had few attributes in common with each other or with their superordinate. A similar but not so marked pattern of attribute overlap was observed for locative attributes, but not for any other contextual attributes. It was argued that information about locations was represented in both autobiographical and semantic memories and that locational information semantically represented may in some instances be employed to access autobiographical memories. It was concluded that autobiographical memories of common items may be connected to and accessed by way of, semantic representententations of locations. It was speculatively proposed that locational information in semantic memory may be represented in a script-like format which mediates connections between semantic categories and corresponding autobiographical memories.

Finally a post-hoc analysis indicated that many of the PI images were of items that might be reasonably judged to have been recently encountered by Ss. This lent some to support to previously observed recency effects in autobiographical memory [this issue is returned to in experiment 6, chapter 9].

CHAPTER 9

CONTENT AND ORGANIZATIONAL DIFFERENCES BETWEEN AUTOBIOGRAPHICAL AND SEMANTIC MEMORIES

This chapter reports two experiments. The first experiment further investigated the content differences between autobiographical and semantic memories found in experiment 3. Semantic primes were found to facilitate the generation of typical instance images and to inhibit the generation of personal instance images. It was concluded that semantic memories were comprised of perceptual information typical of an item and that corresponding autobiographical memories did not contain such typical perceptual information. Data from post-experimental interviews supported the findings of experiment 3 that autobiographical memories contained information about the context in which an item had been experienced whereas semantic memories contained information about the perceptual attributes of items. This experiment also examined organizational differences between autobiographical and semantic memories. It was found that autobiographical memories were not subject to the same typicality effects as semantic memories. It was concluded that autobiographical and semantic memories were organized differently in memory. Further evidence indirectly suggested that autobiographical memories were subject to recency effects.

The second experiment investigated the recency aspect of autobiographical memories. The findings supported the suggestion of the previous experiment that autobiographical memories were subject to recency effects. It was concluded that one of the ways in which autobiographical memories may be organized is in terms of how recently items had been encoded.

Experiment 4

Priming Autobiographical and Semantic Memories

9.1 Introduction

The main finding of experiment 3 was that autobiographical memories contained contextual information whereas semantic memories contained context free perceptual information. One problem with experiment 3 was that the image descriptions may have been, at least in part, a product of 'narrative' conventions [Neisser, 1982]. This criticism proposes that Ss reports of autobiographical memories are structured in terms of implicit conventions that delineate how and what should be reported. In other words an autobiographical memory may contain information other than contextual information but this, by convention is not reported. Presumably the same argument could be extended to Ss reports of semantic memories. Various aspects of the data discussed in experiment 3 questioned this alternative explanation, e.g perceptual idiosyncracies were localized to autobiographical memories, parts of objects which would not have been directly included in an image were not named in descriptions of the images. Further, it could be argued that narrative conventions were themselves a product of the nature of the underlying memory trace. Nevertheless it was decided to refute this alternative explanation fully by more directly investigating content differences between autobiographical and semantic memories.

On the basis of experiment 3 it was reasoned that, as semantic memories had been found to contain context free perceptual attributes, then presenting such information to Ss should facilitate access to semantic memories. Further as autobiographical memories had been found to contain contextually bound information then presenting context free perceptual information should inhibit access to such memories, [because context free perceptual information, at least initially, activates semantic memories, see chapter 4 and below]. If these predictions were supported, in the present experiment then content differences could be quite clearly identified with the content of the underlying memory trace. Narrative conventions [which, it can be argued, are unrelated to memory representations themselves] could not account for such differential access.

It was decided, then, to undertake a priming experiment in which personal and typical instance imagery would be primed. The use of a priming technique in this context seemed particularly appropriate, for the rationale of priming is that a prime can only facilitate a response if it makes possible the activation of a memory representation that contains at least some of the information required to make that response [Rosch, 1975; Posner, 1978; Morton, 1969; Collins and Loftus, 1975]. Different types of prime, therefore, may differentially facilitate [or inhibit] access to autobiographical and semantic memories thus affecting the time taken to generate an image drawn from that memory,[and thus, indicate part of the content of the memory]. Frequently, in semantic priming experiments, the category name, which is presented before the target, acts as the prime and the intervening period is known as the prime/stimulus interval, [Carr, McCauley, Sperber, Parmelee, 1982; Lorch, 1982, Irwin, and Lupker, 1983]. Posner [1978] has determined that, in semantic priming experiments, the optimum prime/stimulus interval was 2 seconds. Typically, in a semantic priming experiment, S is required to make some judgment about the target such that a decrease in the time taken to make the judgment, compared to time taken to make an unprimed judgement, constitutes evidence that priming has taken place. In the present study making a judgment was replaced by generating an image. The dependent variable was the speed with which the image was generated, [see Glass and Meany, 1981; discussed in chapter 5].

In the past, two types of prime have been predominantly used in semantic priming experiments, namely picture and word primes. The main findings have been that pictures afford faster access to semantic information than do words, whereas words afford faster access to acoustic-phonetic information than do pictures, [but see discussion of Irwin and Lupker, 1983, below, in 'Discussion']. Two of the central findings of Rosch [1975(b)] were that the more typical an instance the greater the facilitating effect of a superordinate category prime and that category judgments were maintained at shorter prime-stimulus intervals for picture targets than for word targets. Two general types of argument have been proposed to account for this finding. The first is typified by Rosch [1975(b), 1978] who argued that words and pictures accessed a common semantic store but that pictures gained direct access while words underwent additional processing. Clearly if it is assumed that semantic memory is a repository of attributes, instances and descriptions, a picture 'order of access' effect is to be expected, [see chapter 4]. The second type of argument, associated with the sort of model proposed by Paivio [1971, 1975; see chapter 5], is that words access a verbal store containing name information and pictures access an imaginal store containing, predominantly, semantic information. Both approaches assume that words have only indirect access to semantic information and that pictures have direct access.

However it is not clear whether there is a similar picture/word advantage for autobiographical memories. This is because no research has directly addressed this topic. Priming effects have been observed in episodic memory [Herrmann and Harwood, 1980; McKoon and Ratcliff, 1979; see chapter 2] although these were concerned with the organization of information contained in the episodic trace. The main finding was that priming effects were evident in episodic [autobiographical] memories but only for primes specific to the memory trace.

For these reasons, then, it seemed likely that primes depicting [context free] perceptual attributes would facilitate the generation of typical instance images and inhibit [in comparison to a no-prime condition] the generation of personal instance images. It was decided to employ both word and picture primes and, of course, a no-prime condition. Picture primes were employed because this was the best way to present sets of perceptual attributes. Word primes were employed on the assumption that word meanings [semantic memories] would be activated before associated autobiographical memories on presentation of the word name. It was decided that the picture primes would depict a set of attributes and exemplars typical of a category and that word primes would name the category. It was hoped in this way to facilitate the investigation of organizational differences between the two classes of memory [discussed below].

It was predicted that typical instance [TI] image generation would be fastest to picture primes, slower to word primes [as past work had found], and slowest in the no-prime condition: picture primes should directly activate the semantic category [Rosch, 1975(b)] facilitating TI image generation; word primes should activate the semantic category less than picture primes and so facilitate TI image generation less than picture primes; the no-prime condition should cause no prior activation and, hence, should not facilitate TI image generation.

It was predicted that personal instance [PI] images would be inhibited by both types of primes in comparison to the no-prime control condition. It was reasoned that personal instance image generation would be inhibited by picture and word primes activating the 'wrong' [semantic] areas of memory and therefore inducing the memory search to commence at some location in memory further from the sought after memory trace than the starting point in an unprimed search. Thus PI image generation times to picture and word primes would be raised in comparison to no-prime PI image generation times. However, as experiment 3 had found that personal instance images contained some perceptual information, albeit idiosyncratic, then it was predicted that pictures primes would inhibit the generation of personal instance images less than would word primes. It was predicted then, that PI image generation would be slowest to word primes, somewhat faster to picture primes, and fastest in the no-prime condition.

Beacuse of lack prior research, it was not clear how unprimed personal instance image generation times would compare with unprimed typical instance image generation times. For instance would unprimed personal instance image generation times be faster, slower, same as, image generation times to unprimed typical instance images ?. It may be recalled that, in chapter 5, it was argued that as autobiographical memories are 'rich' memory representations they give rise to complex images and hence take longer to generate than more simple images drawn from semantic memories [Kosslyn, 1980]. A counter proposal to this was that as semantic memories are composed of sets of attributes then images generated from semantic memories take some time to realize because each attribute has be to 'read' into the image [Kosslyn, 1980; see chapter 5], whereas autobiographical memories are like Kosslyn's 'literal' representations which are 'read' complete and directly into the imagery medium and, hence, take only a brief time to generate. It was hoped that the findings from the no-prime conditions would shed some light on these issues. If unprimed typical instance images were generated faster than unprimed personal instance images then this might be related to the 'complexity' of the images. If, on the other hand, unprimed personal instance image generation was faster than unprimed typical instance image generation then this would lend some support to the hypothesis that autobiographical memories were like 'literal' representations. This latter outcome would indicate that autobiographical memories are not organized in terms of attribute overlap as specified in the general model of categorization outlined at the close of chapter 4. Clearly these are issues that bear as directly on models of imagery as on models of memory and as such are somewhat outside the scope of the present thesis. Nevertheless findings which relate to both imagery and the nature of the underlying memories trace will be considered below.

It was also evident that the organization of autobiographical and semantic memories could be directly investigated using the priming technique [see discussion of Rosch [1975(b)] in chapter 4]. If primes were constructed that depicted perceptual attributes central to, or typical of, the category from which the to-be-imaged item was drawn, then it would be predicted that these primes would facilitate the generation of images of typical members of the category more than atypical members: but this should only be the case for TI imagers. Furthermore if the prime was the category name a similar pattern of speed of image generation would be observed. It was decided, then, to employ stimuli from three typicality levels, highly typical, mediumly typical, and atypical. It was predicted that, TI image generation would be fastest to highly typical exemplars, slower to mediumly typical exemplars, and slowest to atypical exemplars: this semantic typicality effect would be most evident to picture primes, somewhat less evident to word primes, and, possibly, not evident at all in the no-prime condition. However it was not clear what typicality effects, if any, would occur to PI images. As experiment 2 had found that ratings of the imagibility of PI images were genrally, but with some exceptions, negatively correlated with typicality it was predicted that PI image generation times would not, in the main, show the semantic typicality effect. Yet this prediction applied only to the no-prime PI condition. It was unclear what effects, if any, the picture and word primes would have upon typicality in PI. No predictions were made concerning primes and typicality in PI.

The general predictions of the experiment were; a] that primes would differentially facilitate typical instance image generation and differentially inhibit personal instance image generation, [thus the content hypothesis would be supported and the 'narrative conventions' criticism defused, for the underlying memories would be directly activated]; b] organizational differences between the two memories would differ in their interaction with typicality [further questioning the 'narrative conventions' criticism]. These predictions are detailed, in terms of the experimental design, in the method section, below.

9.2 Method

A mixed design was employed. Ss took part in one of six groups. There were two instruction groups [IG]: personal [PI] and typical [TI], instance imagers, and nested within each of these instruction groups were three priming conditions [PC]; word [W], picture [P], and no-prime [N]. Thus the experimental groupings were W-TI, P-TI, N-TI, W-PI, P-PI, and N-PI. Ss were required to generate images of 54 items [I] drawn from 9 categories [C], two from each of 3 levels of typicality [T], highly typical [HT], mediumly typical [MT], and atypical [AT]. Thus the design was a 2 by 3 between Ss by 9 by 3 by 2 within Ss, illustrated in Table 9.1.1, over.

It was decided to treat both Ss [S] and Is as random factors [Clark, 1973]. The experimental model was: between group factors IG [two levels], PC [three levels] crossed with IG; Within group factors, C [nine levels], T [three levels], I [two levels], with C and T nested within I: 'IG,PC,S(IGPC),C,T,I(CT)'. The dependent variable was image generation time [IGT] measured from the end of the target word presentation to response. A two second prime-stimulus interval was employed, [see Rosch, 1975; Posner, 1978]. Ss were randomly allocated to groups and each S recieved a random ordering of stimuli. Ss also undertook a post-experimental interview in which they were required to describe a selection of their images.

Table 9.1.1 Experimental Design used in Experiment 4

			Between Subjects Factors					
Imagery Instructions IG=			PI			TI		
	Primes P =		P	W	N	P	W	N
	Category 1							
Within Subjects Factors	TYPICALITY	HT I1						
		I2						
		MT I1						
		I2						
		AT I1						
		I2						
	Category 2	etc.						

One further consideration related to the finding by Eddy and Glass [1981] that reading interfered with the comprehension of high imagery sentences, suggesting that a visual task, such as reading a target item, might interfere with image generation. It was decided, therefore, to present the primes visually and the to-be-imaged targets aurally.

Experimental Hypotheses

The following hypotheses were investigated:

A] Content Differences

1) Primes overall would facilitate TI IGTs more than PI IGTs.

2) TI IGTs would be fastest to P, slower to W, and slowest in the N.

3) PI IGTs would be fastest in N, slower P, and slowest in W.

4) Hence no main effect of Primes was predicted and a main effect of IG was dependent on TI image generation being the same as, or faster than, PI image generation.

The main prediction was that of a significant Primes by IG interaction.

B] Organizational Differences

1) A T by IG interaction was predicted. TI would show strong typicality effects, PI would show no, or negative T effects.

2) An IG by Primes by T interaction was predicted. P and W primes would induce strong T effects in TI but not in PI.

No other main effects or interactions of theoretical significance were predicted.

Subjects

60 Ss took part, all Open University staff members. There were 28 males and thirty two females with an age range of 20 to 35 years and a mean age of 30 [to nearest year]. All Ss were english speaking U.K. nationals. There were 10 Ss to each experimental group. Ss were paid one pound.

Stimulus Selection

The target stimuli were selected from the stimulus set employed in experiment 2 and were comprised of two items drawn from HT, MT, and AT, levels of typicality from each of the nine categories, Weapon, Fruit, Sport, Furniture, Vegetable, Vehicle, Toy, Clothing, Bird, [see appendix C for a full list of stimuli]. There were 54 target items. From the remaining exemplars nine items were selected, one from each category, to act as practice stimuli. The superordinate category names constituted the prime stimuli.

Exemplars from different categories were approximately balanced in terms of their ranked typicality and TI and PI imagibility, in the following way: each category was divided into three areas HT, MT, and AT. HT exemplars had a ranking of 6 or higher, MT exemplars had a ranking falling between 21 and 32, and AT exemplars had a ranking of 40 or lower, on typicality ratings only. Exemplars were selected from these three groups that had similar imagery ratings. TI and PI imagery ratings for exemplars selected from HT, MT, and AT, across all categories were all less than 3.0, indicating that these exemplars had been rated as highly imagable. Within typicality levels and across categories exemplars varied equally in their rated PI and TI imagibility. Overall PI ratings were slightly higher than TI ratings.

Stimulus Construction

1] Target Stimuli

All the target stimuli were tape recorded, [a female voice was used], and digitized on a PDP 11 computer. The digitized words were edited to eliminate lengthy pauses within words and to generally raise the clarity of the words. The shortest word was 0.43 seconds and the longest was 0.92 seconds with a mean of 0.64 seconds.

2] Prime Stimuli

Black and white negatives of the word primes were constucted and mounted, individually, on Kodak Carousel slide binders. A red coloured slide was constructed to act as the no-prime stimulus. The picture primes were constructed in the following manner. Twenty six superordinate category names [listed in appendix C], including the nine category primes, were selected from the Battig and Montague [1969] category norms on the basis that each category was named by a single word and could be easily represented pictorially. Four or five highly typical exemplars were selected from each category [target items already selected were not included in this selection procedure] and simple line drawings were made of every item. For each category a composite picture depicting four or five line drawings of highly typical exemplars was constructed [see example in Appendix C]. Black and white slides were made of the pictures representing the nine prime categories and these were mounted on Kodak Carousel slide binders [24mm by 36mm].

Apparatus

A three-field group of Kodak Carousel SAV 2000 projection tachistoscopes were used. Each tachistoscope was fitted with Projar lenses, focal length 250mm, that produced a 0.23 wide projection at a distance of two meters. A response box containing two response keys set 100mm apart was employed. All the apparatus was controlled from a PDP 11/34 computer, running RSX 11M, which also measured and recorded Ss responses. The software for this experiment was written by Dr M. Levoi of the Open University Psychology Unit.

Procedure

Ss took part in the experiment individually and, upon arrival at the laboratory, were assigned a number that randomly allocated them to one of the six experimental conditions. Ss were seated in a small room in front of and below a bank of projection tachistoscopes. Immediately in front of S was a table upon which was the response box and in front of the table was a projection screen. The distance between the tachistoscopes and screen was two meters. Ss were positioned so as to directly face the visual display which was 1.5m in front of them at a height of 1.5m. S then read the following instructions, according to which image instruction group they had been assigned, TI or PI:

TI] "This study is concerned with the mental images we can bring to mind of every day objects and activities, such as items of furniture, articles of clothing, sporting activities, and the like. You will hear a word naming a common object or activity and YOU ARE ASKED TO FORM A VIVID MENTAL IMAGE OF A TYPICAL INSTANCE OF THE NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE. This means that you should try to form an image that most people would agree is a typical example of the named item. For example if the named object were BICYCLE you would be required to form an image of a typical instance of bicycle even though you personally may own a tandem and therefore might find it easy to bring to mind an image of a tandem. To reiterate: YOU ARE

ASKED TO FORM A VIVID MENTAL IMAGE OF A TYPICAL INSTANCE OF A NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE.

The experimenter will now demonstrate to you the procedure you are asked to follow. You will have a chance to reread these instructions later and also you will have a chance to undertake some practice trials."

PI] "This study is concerned with the mental images we can bring to mind of every day objects and activities, such as items of furniture, articles of clothing, sporting activities, and the like. You will hear a word naming a common object or activity and YOU ARE ASKED TO FORM A VIVID MENTAL IMAGE OF A PERSONAL INSTANCE OF THE NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE. This means that you should try to form an image of an actual object or activity with which you are personally familiar rather than a typical or general image the object. For example if the named object were BICYCLE you would be required to form an image of a personal instance of a bicycle and thus you might bring to mind an image of, say, a tandem bicycle that you personally own, or,if you do not own a bicycle, you would form an image of a bicycle that you have actually seen somewhere. To reiterate: YOU ARE ASKED TO FORM A VIVID MENTAL IMAGE OF A PERSONAL INSTANCE OF A NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE.

The experimenter will now demonstrate to you the procedure you are asked to follow. You will have a chance to reread these instructions later and also you will have a chance to undertake some practice trials."

The following procedure was then verbally outlined to Ss:

"The words naming the objects and activities which you must image will be verbally presented to you over a set of headphones which you will wear throughout the experiment. On the table in front of you is a 'response box' that contains two response buttons. You are asked to keep your left thumb on the left hand response button and your right thumb on the right hand response button. Indicate that you have formed your image by pressing BOTH buttons simultaneously.

In addition to the words you will hear presented over the headphones will be information that will be presented visually on the screen in front of you and you must closely attend to this information before you form your image..."

Ss then received one of the following procedures depending upon their prime group, W,P,N,:

W] "...Initially the screen will display a small cross known as a 'fixation' field and, as you might expect, you must visually fixate upon this cross. After a short delay the cross will be taken off-screen and relaced by a word. [At this point Ss were shown a list of the twenty six category names that had been selected and asked to read through them. Ss were then told that the words in the experiment would be something like these sorts of words]. You must be sure to read and understand this word. After a short interval the word will be taken off-screen and only a blank screen will remain. Two seconds after this you will hear a word over the headphones and it is whatever is named by this word that you must image. So the word going off-screen warns you that you are about to hear a word over the headphones. In the interval, between the word going off-screen and a word being named to you over the headphones, repeat silently to your self the word that you saw on the screen. The word that you see on the screen will generally help you to form an image. Note that each word may be repeated a number of times. This whole cycle is started by you each time that you press both response buttons to indicate that you have formed an image..."

P] "...Initially the screen will display a small cross known as a 'fixation' field and, as you might expect, you must visually fixate upon this cross. After a short delay the the cross will be taken off-screen and relaced by a picture. [At this point Ss were shown the twenty six pictures that had been prepared and asked to 'name the category' that picture represented. All Ss correctly named all the pictures. Ss were then told that the pictures in the experiment would look like some of these pictures]. You must be sure to get a good long look at the picture. After a short interval the picture will be taken off-screen and only a blank screen will remain. Two seconds after this you will hear a word over the headphones and it is whatever is named by this word that you must image. So the picture going off-screen warns you that you are about to hear a word over the headphones. In the interval, between the picture going off-screen and a word being named to you over the headphones, try to hold in your mind's eye an image of the picture you have just seen. The picture that you see on the screen will generally help you to form an image. Note that each picture may be repeated a number of times. This whole cycle is started by you each time that you press both response buttons to indicate that you have formed an image..."

N] "...Initially the screen will display a small cross known as a 'fixation' field and, as you might expect, you must visually fixate upon this cross. After a short delay the the cross will be taken off-screen and relaced by a coloured slide. You must name to your self the colour of the slide. After a short interval the coloured slide will be taken off-screen and only a blank screen will remain. Two seconds after this you will hear a word over the headphones and it is whatever is named by this word that you must image. So the coloured slide going off-screen acts as a warning that you are about to hear a word over the headphones. Note that each coloured slide may be repeated a number of times. This whole cycle is started by you each time that you press both response buttons to indicate that you have formed an image..."

Having understood these instructions Ss then reread their imagery instructions and undertook the nine practice trials. During both the practice trials and the experimental runs external lighting in the laboratory was extinguished, the only light came from the tachistoscopic displays, and the experimenter retired to a separate room. S's responses were monitored on a VDU. The majority of Ss did not realize that they were being timed. It was suggested to Ss immediately prior to the test runs that they adopt one of two imagery strategies; a] projecting the image onto the illuminated blank tachistoscopic display, b] closing their eyes. In the second case it was stressed that the S must reopen their eyes AS they registered a response and keep them open until they heard the next item to be imaged. All Ss were aware that they would be asked about aspects of the experiment after completion of the experimental trials. This part of the experiment took, on average, 25 minutes.

Immediately after the experimental run Ss were asked to describe three of the images they had formed. Items were randomly selected for description, however if an S could not recall a particular item he/she was invited to recall the image of any item that came to mind. Ss were also asked about the difficulty of the experiment and their understanding of its purpose. This part of the experiment lasted about 10 minutes.

An extensive pilot study, with a slightly different design, assessed this procedure. Although results from that study do not feature in this report it should be noted that a further 44 Open University members of staff who acted as Ss also named, without error, the pictures depicting the superordinate categories.

9.3 Results

A mixed model analysis of variance was performed which employed the model 'IG,PC,S(IGPC),C,T,I(CT)', [IG=imagery instruction groups, PC=priming conditions, S=subjects, C=categories, T=typicality, I=items]. Factors not in parentheses are crossed with all other factors and factors in parentheses are nested within the immediately preceding, unenclosed, factor. The data were log transformed and all calculations were performed on the transformed data. Quasi F ratios were calculated for all main effects and interactions and these are denoted by F′. All other F values are denoted by F. The results are reported in four sections: the first section reports findings bearing on the content hypothesis; the second section reports findings bearing on the hypotheses relating to organizational differences; the third section reports findings from the post-experimental interview; and the fourth, and final, section reports other findings.

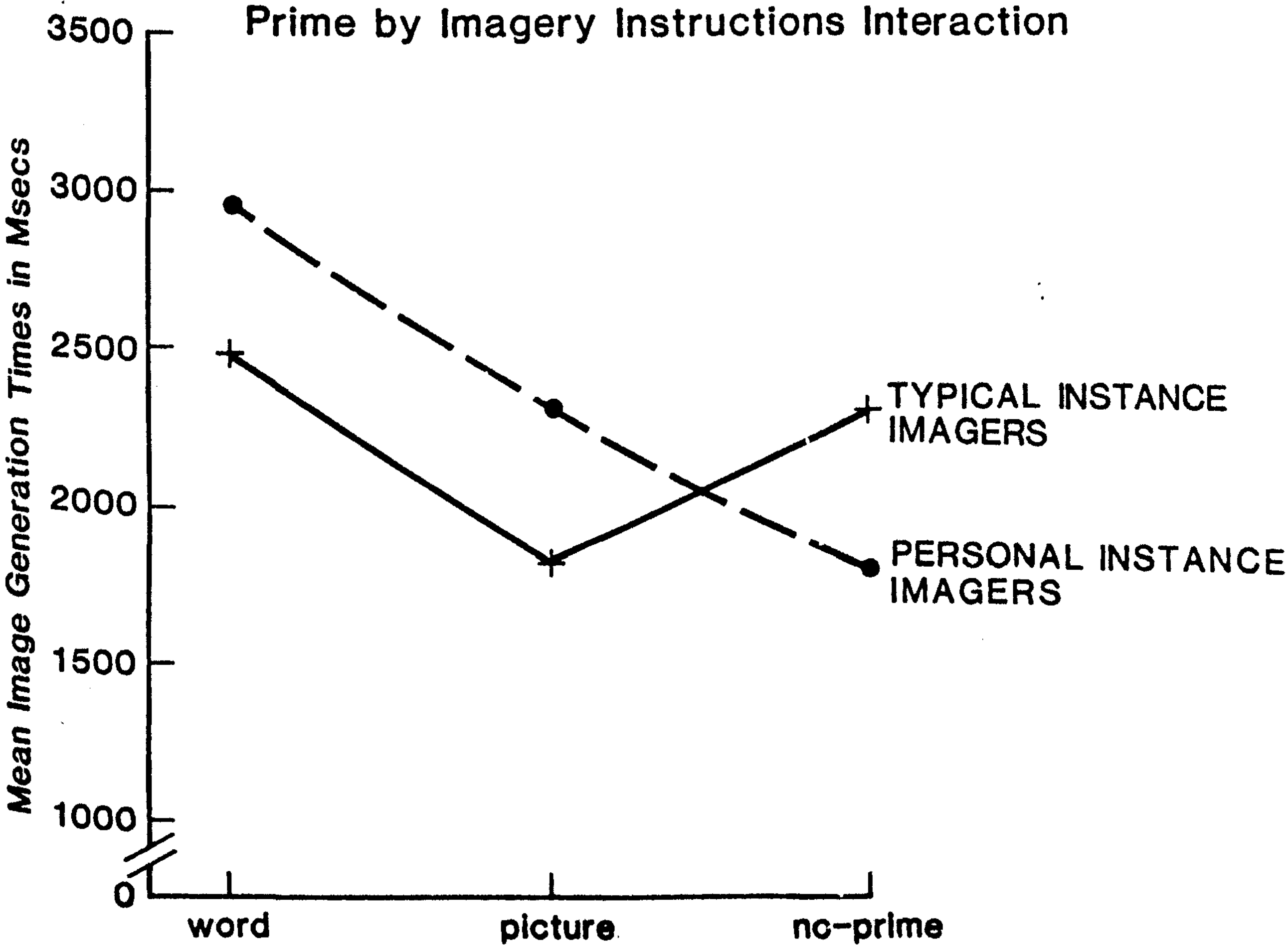
A] Content Differences

Imagery Instructions: no significant main effect for groups, IG, was found. Although TI imagers [2225 msecs] had IGTs 167 msecs faster than PI imagers [2392 msecs]. It will become evident below that this overall similarity in IGTs was related to an unpredicted effect of word primes in the TI condition.

Primes: an unpredicted significant main effect for primes, PC, was observed, $F'(2,55)$ 6.16 $p<0.01$ and two orthogonal planned comparisons found that IGTs to W [word primes] were significantly slower than the average of IGTs to P and N [picture primes and no-primes], $F(1,1458)$ 6.63 $p<0.01$, but that P and N did not significantly differ, $F(1,1458)$ 0.005. The mean IGTs, in msecs., for each condition were, W 2728, P 2108, N 2090. This finding is in contrast to the prediction that there would be no overall effect of primes. It is evident that word primes produced unexpectedly slow IGTs.

<u>Imagery Instructions by Primes Interaction</u>: a significant IG by PC interaction was found, $F'(2,56)$ 3.64 $p<0.05$. Figure 9.1.1 presents a graph of this interaction. Orthogonal planned comparisons found that: a) within TI IGTs to P were faster than IGTs to N by 518 msecs., and this was just outside significance, $F(1,1428)$ 3.036 $p<.08$. Whereas IGTs within PI were faster to N than P by 553 msecs., which was significant $F(1,1428)$ 5.55 $p<0.025$. The hypothesis that the no-prime condition would give rise to fastest IGTs in PI was supported. However the hypothesis that perceptual primes would most facilitate TI image generation received only tentative support. b) between imagery instruction groups, P primes in TI gave rise to significantly faster IGTs than P primes in PI, $F(1,1428)$ 4.78 $p<0.05$, and the difference was 543 msecs. ; N gave rise to faster IGTs in PI than TI this was just outside significance, $F(1,1428)$ 3.73 $p<0.06$, and the difference was 528 msecs. ; W gave rise to faster IGTs in TI than PI but this was outside significance, $F(1,1428)$ 2.803, $p<0.10$, the difference was 488 msecs. These findings supported the hypotheses that picture primes would signicantly facilitate TI image generation in comparison to PI image generation and that the no-prime conditon would facilitate PI image generation. However the finding that no-primed image generation was as fast as picture primed TI image generation was suprising and the finding that word primes inhibited TI image generation was the reverse of the earlier prediction.

Fig 9 1.1
Prime by Imagery Instructions Interaction



Despite some unpredicted effects, the overall pattern of these findings tentatively supported the hypothesis that typical instance images predominantly contain perceptual information whereas personal instance images do not. The differences between means were very large for this type of experiment, e.g of the order of half a second. Typically image generation experiments find mean differences of the order of 150 to 250 msecs., [Glass and Meany, 1978; Kosslyn, 1980]. That these large mean differences were not always significant indicated that there was a large amount of variability in the data and this is discussed below.

B] Organizational Differences

Typicality: a highly significant main effect of typicality [T] was found, $F(2,41)$ 19.76 $p<0.0001$. Two orthogonal planned comparisons found that the average of IGTs to mediumly typical [MT] and atypical [AT] items were significantly slower than IGTs to highly typical [HT] items, $F(1,1458)$ 13.14 $p<0.001$, but that IGTs to MT and AT were not significantly different. The mean IGTs, in msecs, were, HT 2069, MT 2389, AT 2467. Overall highly typical items were the easiest to form images of and there appeared to be little difference between medium and atypical items. It will be seen below that this effect is best interpreted in the light of the finding of a three-way intercaction between typicality, primes, and IG.

Typicality by Groups Interaction: no significant interaction of T with IG was found, although this effect was in the predicted direction, F(2,86) 2.20 p<.10. Thus the hypothesis that PI would either be unaffected by, or negatively effected by typicality was not supported. Collapsed over primes both TI and PI exhibited similar effects of typicality.

Typicality by Primes Interaction: T was found to significantly interact with PC, F(4,225) 5.63 p<0.01 and this is graphed in Figure 9.1.2. The Newman-Keuls method applied to these means found that IGTs in W were significantly slower than IGTs in P and N at all levels of T. This finding shows the unpredicted inhibition of image generation by word primes, which has already been mentioned.

The apparent implication of the unpredicted findings is that autobiographical memories are subject to typicality effects. However a further finding casts doubt upon this interpretation.

The Groups by Primes by Typicality Interaction: all the above effects combined in a significant three way interaction of IG by PC by T, F′(4,156) 6.19 p<0.01. Figures 9.1.3 and 9.1.4 plot the the mean IGTs involved in this interaction. Newman-Keuls analysis applied to these means revealed three

Fig9 1.2

Typicality by Primes Interaction

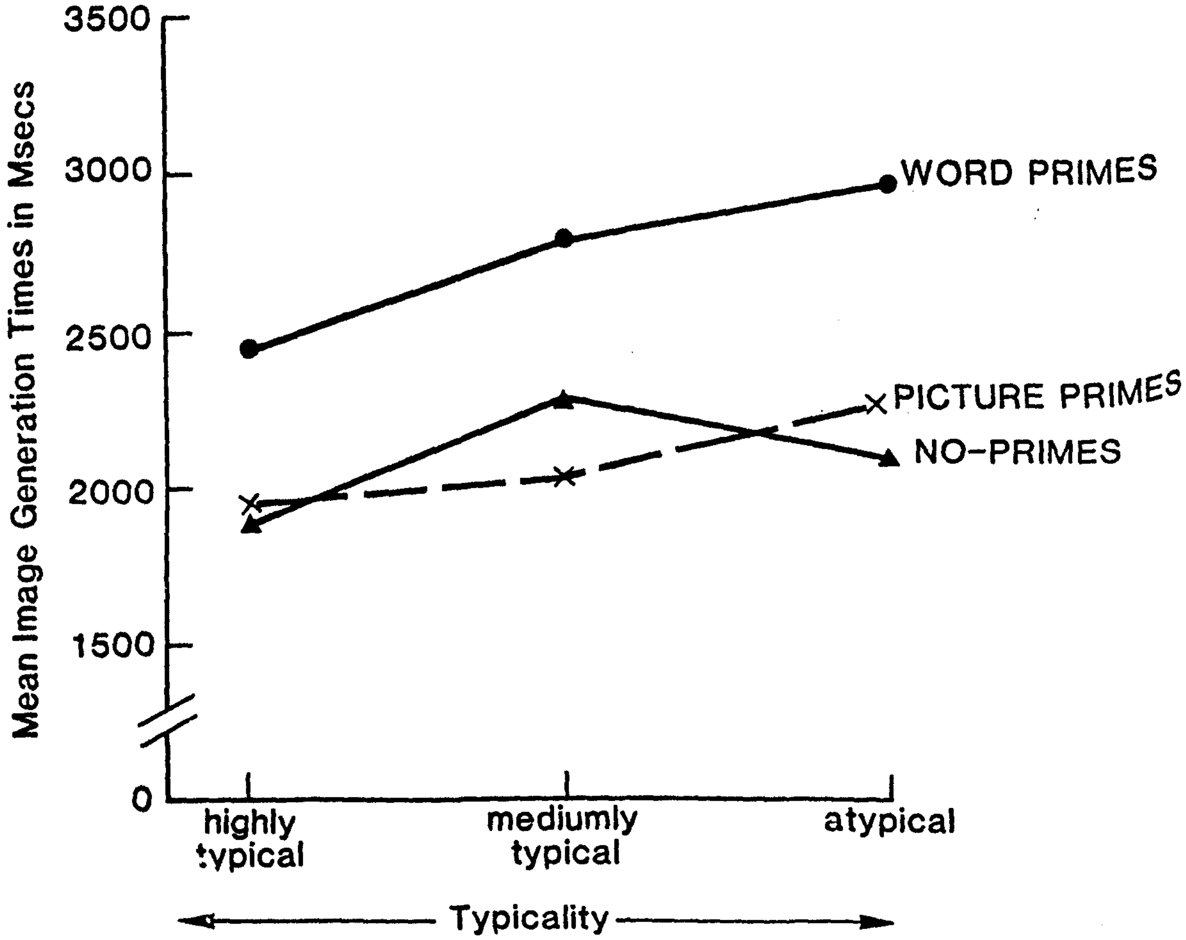


Fig 9 1.3

Groups by Primes by Typicality Interaction

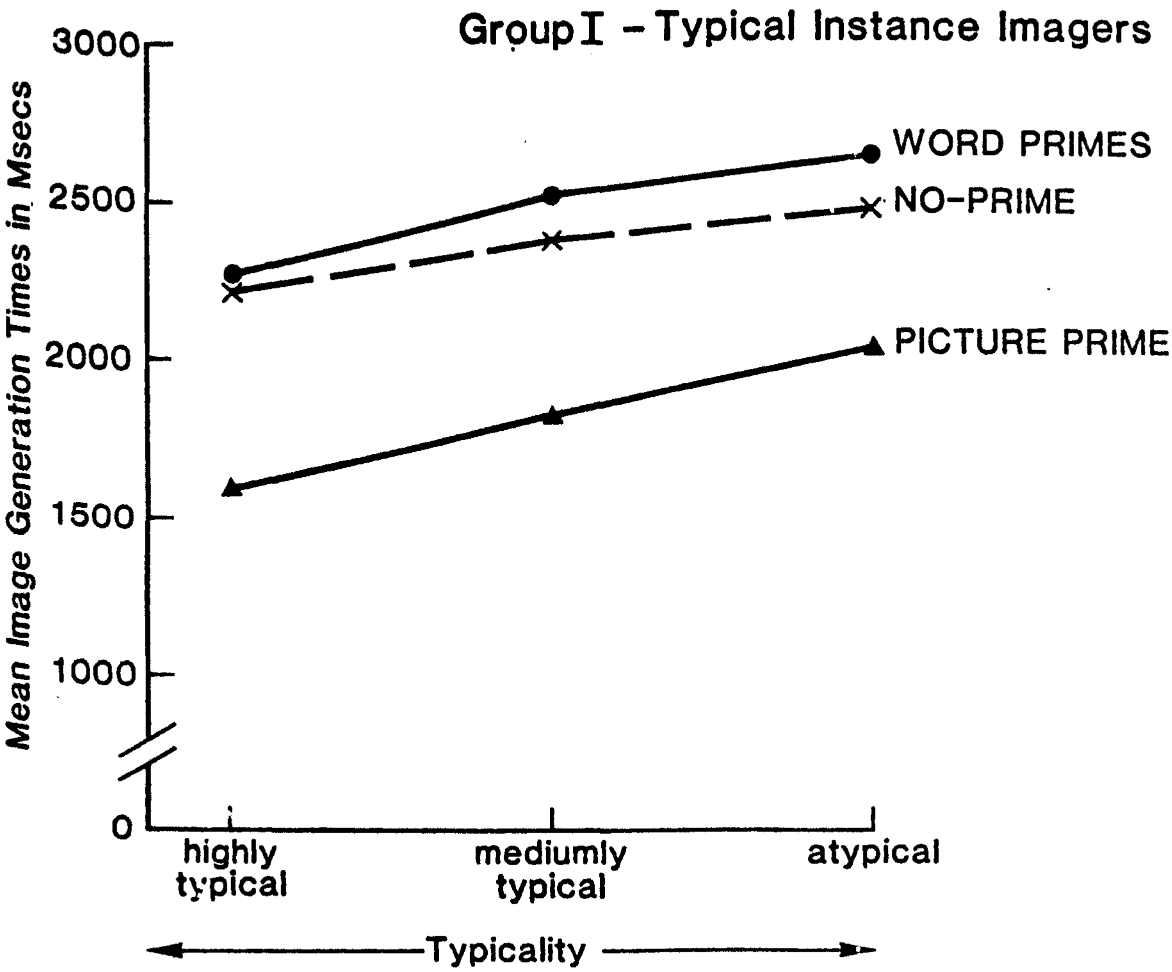


Fig 9 1.4

Fig 9.1.4

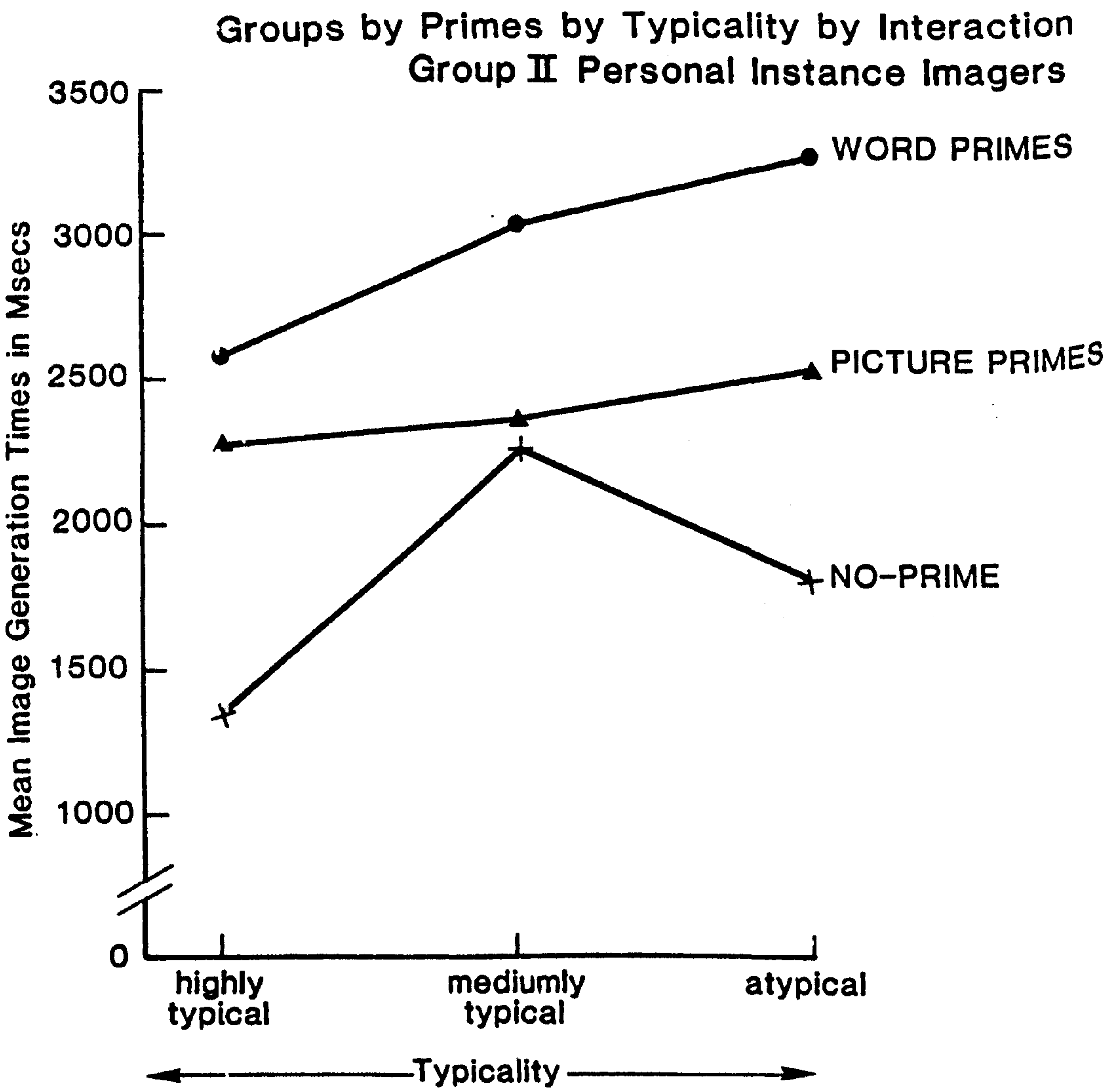

Groups by Primes by Typicality by Interaction
Group II Personal Instance Imagers
Mean Image Generation Times in Msecs
3500
3000
2500
2000
1500
1000
0
WORD PRIMES
PICTURE PRIMES
NO-PRIME
highly typical
mediumly typical
atypical
Typicality

Table 9.1.2 Grouping of Conditions in Imagery Instruction by Primes by Typicality Interaction found by the Neuman-Keuls Method, and Ordered from Fastest to Slowest Mean Image Generation Times. [see Figures 9.1.3 and 9.1.4]

FASTEST SLOWEST

GROUP	PI	TI	PI	TI	TI	TI	PI	PI	TI	TI	PI	TI	PI	PI	TI	TI	PI	PI
PRIME	N	P	N	P	N	P	P	N	W	N	P	N	P	W	W	W	W	W
TYPICALITY	HT	HT	AT	MT	HT	AT	HT	MT	HT	MT	MT	AT	AT	HT	MT	AT	MT	AT
	—	—	—															
				—	—	—	—	—	—	—	—	—	—	—	—			
															—	—	—	—

Groups of means underlined by a common line do not differ from each other but do differ significantly from other groups of means.
[PI= Personal Instance Imagers TI= Typical Instance Imagers P= Picture Prime W= Word Prime N= No-prime HT= Highly Typical MT= Mediumly Typical AT= Atypical]

groupings of means: the fastest IGTs which are not significantly different from each other are PI-N-HT, TI-P-HT, and PI-N-AT; the slowest IGTs which are not significantly different from each other are PI-W-AT, PI-W-MT, and TI-W-AT; the remaining means are not significantly different from each other. These three groupings are depicted in Table 9.1.2, above, ordered from fastest to slowest.

These groupings of means show that although word primes inhibited both types of imagery they inhibited PI imagery at MT and AT levels to an extreme degree. This effect of word primes is discussed below where it is argued that the word prime manipulation failed in its intended effect.

It is also clear that the pattern of responding was different, in terms of typicality, for TI when primed by P in comparison to PI unprimed. The important finding is that in PI-N there was no significant difference between IGTs at HT and AT typicality levels showing that, when unprimed, the speed of generating personal instance images failed to increase with typicality (as predicted).

TI-P did exhibit the predicted typicality effect and TI-N also exhibited the predicted typicality effect.

In summary these findings supported the hypothesis that typicality is a major feature of the organization of semantic memory: however the findings only provide limited support for the hypothesis that typicality does not feature in the organization of autobiographical memory. This was evident only in the PI no-prime condition.

In additon failure to support some of the predictions and the emergence of unpredicted findings place constraints on the inferences which can be drawn from the results. These issues are discussed below.

C] Post-Experimental Interviews

Immediately after the experiment Ss were asked to recall and describe three of their images. Employing the same classification procedure as that used in experiment 3, it was found that descriptions of personal instance images were dominated by contextual information whereas typical instance images were dominated by perceptual information. It was concluded that Ss imagery in this experiment was similar to Ss imagery in experiment 3 and that personal and typical instance images had, in fact, been generated.

Ss were also asked if they had experienced any difficulties in generating images and if they had in some instance been unable to bring an image to mind. Overall Ss claimed to have found image generation easy. However most Ss, in both TI and PI, mentioned difficulty in generating images of weapons. No S claimed to have failed to generate an image.

D] Other Findings

Three other effects were found to be siginificant.

Categories: firstly a significant category [C] effect was found, $F'(8,41)$ 5.75 $p<0.01$. Newman-Keuls analysis performed upon the mean IGTs for each category found that mean IGT to the category Weapon differed significantly from all other means and that the categories Bird, Sport, and Vehicle, differed significantly from the category Fruit, which had the fastest mean IGT. Such a category effect had been expected on the basis of experiment 2 although the direction of such an effect had not been predicted.

Categories by Imagery Instructions Groups Interaction: secondly, a significant C by IG interaction was observed, $F'(8,260)$ 4.32 $p<0.01$. A Newman-Keuls analysis found that the mean IGT to the category Weapon in PI differed significantly from all other means and that the mean IGTs for the categories

Table 9.1.3 Groupings of Categories Within Imagery Instruction Groups found by the Newman-Keuls Method.

Fastest Slowest

IG	PI	TI	TI	TI	PI	TI	TI	PI	PI	TI	PI	TI	PI	PI	TI	TI	PI	PI
Category	FU	FU	VG	FT	FT	TY	CL	CL	VG	BI	BI	VH	TY	SP	SP	WP	VH	WP

Categories underlined by a common line do not differ significantly from each other but do differ significanly from other groups of categories.

IG= Imagery Instruction group
PI= Personal Instance Imagers TI= Typical Instance Imagers

FU= Furniture VG= Vegetables FT= Fruit CL= Clothing TY= TOY
BI= Bird VH= Vehicle SP= Sport WP= Weapon

Weapon in PI, Weapon in TI, and Vehicle in PI, differed significantly from the fastest mean IGT which was to the category Furniture in PI. These groupings for the C by IG interaction are listed in Table 9.1.3.

As expected then, some categories overall were easier to image than other categories. In additon, within PI and TI the ordering of categories were, in terms of speed of IGT, different. These findings were largely due to exceedingly long IGTs, which occured in in both PI and TI, when Ss generated images of exemplars from the category Weapon.

Subjects: thirdly a significant subjects [S] effect was found, $F'(54,1458)$ 45.0 $p<0.000$, indicating fairly high variability in Ss ability to generated images generally. However as this did not interact with any other factor it was concluded that fast and slow imagers were equally distributed between the experimental groupings. No other significant effects were observed.

9.4 Discussion

A number of unpredicted effects and the failure to support some predictions must clearly be taken into account in assessing the status of the present findings. Hence the two general hypotheses, a] that the different contents of autobiographical and semantic memories would be differentially activated by different primes, and b] that the different organization of autobiographical and semantic memories would be reflected in the diferent effects of typicality upon the two classes of memory, did not receive unconditional support.

However examination of the findings suggested that the unpredicted effects were localized to two factors; a] the effect of word primes in TI and, b] an unexpected effect of picture and word primes in PI. The effect of word primes is discussed first then the principle findings are considered. The effect of picture and word primes is considered in the context of the finding of a triple interaction of imagery instructions by primes by typicality.

A highly significant unpredicted finding was that word primes inhibited image generation in TI [see Figure 9.1.1, above]. IGTs to word primes in TI were slower than IGTs to no-primes and picture primes, respectively. IGTs to word primes in TI were over 600 msecs slower than IGTs to picture primes and over 140 msecs slower than IGTs to no-primes. A plausible explanation of this finding may be made in terms of the methodology for the experiment. In the word priming condition [in both TI and PI], Ss were required to repeat the category name silently during the two second prime/stimulus interval. Assuming that Ss actually did this, it may have been the case that word primes received only shallow processing. In a recent semantic priming experiment Irwin and Lupker [1983] also found no difference between word primes and no-primes. These researchers further found that naming [i.e. repeating the category name during the prime/stimulus interval] was carried out at a shallow level of processing [Craik and Lockhart, 1972]. The word primes in the present experiment may, then, have been held in an acoustic/phonetic store until the presentation of the to-be-imaged target. If so the words would not have acted as primes and an extra processing burden may have been inadvertently placed upon Ss who may have attempted to make a connection between prime and target virtually simultaneously. Some support for this interpretation emerged in the post-experimental interview where Ss, in both TI and PI, spontaneously, complained of 'not being able to see the connection' between the word primes and to-be-imaged targets. This then would account for the unpredicted finding that IGTs to word primes in TI were slower than IGTs to no-primes, [it had been predicted that picture primes would produce the fastest IGTs in TI].

However this explanation also extends to IGTs given to word primes in PI. Afterall Ss in this conditon also spontaneously complained that they could see little relation between word primes and targets. Yet this complicates the explanation: for IGTs to word primes in PI were over 450 msecs slower than IGTs to word primes in TI and this difference was just outside significance. This suggests that word primes inhibited PI imagery more than TI imagery and therefore must have played more than a 'shallow' role in accessing the underlying memories. A plausible explanation for these findings is as follows: in both TI and PI word primes were held at a shallow level of processing until presentation of the target. At target presentation the rehearsed prime was then employed to locate the appropriate information in memory. As the word prime was the category name this facilitated TI image generation more than PI image generation because the underlying semantic memories from which the TI images were drawn were organized around a category prototype accessed by the category name whereas the underlying autobiographical memories were organized differently. Thus, it is proposed that, word primes acted not as primes but more as cues in a memory search. Hence the lengthy IGTs within and between both imagery groups. It will be argued below that these very slow IGTs to word primes acted to obscure and distort some of the predicted typicality effects.

[It should be noted that there is an alternative explanation of the word prime findings: it may be argued that words generally increased image generation times because they had to be recoded from an acoustic code to some code which directly accessed memory. Note that this explanation emaphsises coding issues and sets aside the issue of organization. In other words it is argued that regardless of organization in memory words always access memory indirectly. Clearly this is similar to the proposals of Rosch [1975(b)] and Paivio [1975] discussed in the introduction, although their arguments that words gained indirect access were specific to <u>semantic</u> memory rather than applying to memory generally. In order to account for the differences between PI and TI word priming, this type of argument would have to make the additional assumption that words accessed semantic memories faster than autobiographical memories. Unfortunately there is no evidence bearing on this latter assumption and hence the prior explanation, emphasising categorical organization in semantic memory is to be prefered. The view taken here is that given that the two classes of memory are equated on other factors then words will access semantic and autobiographical memories equally quickly. This position is also compatible with the unitary model of memory discussed in chapter 4]

The prediction that there would be no overall effect of primes was not supported. Word primes gave rise to significantly slower IGTs. However overall there was no significant difference between picture primes and no-primes supporting the prediction for these two groups only.

The prediction of a primes by group interaction was strongly confirmed [see Figure 9.1.1, above]. However, for the reasons outlined above, the effect of word primes in this interaction may be regarded as of little significance. The main finding of interest is the cross over of IGTs to picture primes and no-primes in TI and PI. These findings lend fairly strong support to the hypothesis that semantic memories were comprised of perceptual attributes whereas autobiographical memories were not. That is, when there is a compatibility between the content of the prime and the content of the memory the prime is helpful. In contrast, when the content of the prime conflicts with the type of information held in the memory, the prime is positively unhelpful. One difference which was expected, although its direction was not predicted, was that no-prime PI IGTs were significantly faster than no-prime TI IGTs but virtually the same as picture primed TI IGTs. This showed that autobiographical memories, in the absence of priming, were more quickly imaged than semantic memories. This suggests that autobiogaphical memories may ressemble Kosslyn's 'literal' encodings activation of which gives rise directly to an image. In contrast semantic memories were generated fastest when when primed with perceptual attributes suggesting that the underlying memories were comprised, at least in part, of perceptual attributes. Overall then, the latter findings support the content hypothesis and also confirm the finding of experiment 3 that semantic memories contained general perceptual attributes whereas autobiographical memories did not. This clearly argues against the 'narrative convention' interpretation of the results of experiment 3: if it were the case that Ss PI images in experiment 3 contained context free perceptual attributes which were not included in their descriptions, then picture primes in the present experiment should have facilitated PI image generation, which they did not. Thus the 'narrative conventions' criticism is rejected.

An unpredicted overall effect of typicality was found. Highly typical exemplars were imaged faster than mediumly typical and atypical exemplars for both TI and PI groups. This finding is interpreted below when the three way interaction of imagery instructions by primes by typicality is considered.

An unpredicted interaction of primes by typicality was observed, [see Figure 9.1.2, above]. This was accounted for by the slow IGTs present in the word prime conditions. IGTs to picture and no-primes, at all typicality levels, were indistinguishable.

The predicted typicality by imagery instruction groups interaction was not observed. Both PI and TI gave rise to similar typicality effects. This is discussed in the context of the 3-way interaction.

Finally the predicted 3-way interaction of imagery instructions by primes by typicality was observed although the precise pattern was not entirely as predicted [see Figures 9.1.3 and 9.1.4, above]. Two effects were clear from this interaction; firstly typicality has similar effects in all conditions with the exception of PI no-prime. These effects of typicality had been predicted for TI [although in order picture prime, word prime, no-prime, rather than the observed picture prime, no-prime, word prime], but had not been predicted for PI. For PI it had been predicted that either typicality effects would not be present or that they would be anomolous. A plausible explanation, suggested by the data, for effects of typicality on PI images primed with pictures was as follows: the picture prime activated the semantic category and the memory search for an appropriate autobiographical memory commenced at this point. Highly typical semantic representations were more activated than mediumly typical and atypical semantic representations, in that order. Because atypical exemplars took longer to image in the PI picture prime condition it seems likely that the memory search commenced by locating semantic memories <u>before</u> autobiographical memories. Hence the differences in IGTs at different typicality levels in this condition were due to the initial time spent locating semantic memories. This suggests that once the semantic category had been activated subsequent memory searches automatically started from semantic memories. A similar account would apply to the PI word prime typicality effect with the proviso [see above] that the semantic category was activated almost simultaneously to the target being registered. It is proposed then that primes that activate semantic categories compelled a search of semantic memory prior to a search of autobiographical memory: hence typicality effects in the prime conditions in PI and also the longer time taken to generate images when primed compared to when not primed in this group. Thus the PI primed typicality effects cannot be taken as indicating that autobiographical memories were organized in terms of typicality. This line of reasoning is further supported by findings in the PI no-prime condition.

IGTs in the PI no-prime condition were significantly faster than IGTs in the PI picture primed condition. If it had been the case that typicality was an organizational factor in autobiographical memory, as in semantic memory [and also as the PI picture prime IGTs may have suggested] then the effects of typicality should have corresponded exactly with those observed for semantic memory. However in the PI no-prime condition it was found that IGTs to highly typical and atypical exemplars were not significantly different from each other and that both were significantly different from IGTs to mediumly typical exemplars which were considerably slower. Though this is the only condition in which the semantic typicality effect is not evident, the finding is striking: why should personal instance images of mediumly typical exemplars take longer to generate ?. One possible explanation related to the experimenter's observation that the objects and activities comprising the medium typical exemplars were generally less frequently encountered than exemplars from other typicality levels. This suggested, given that the more frequently an item is encountered the more probable it is that the item has been recently encoded, that mediumly typical exemplars may have been less recently encoded than other items. Thus, if autobiographical memories were organized, at least partly, in terms of recency of encoding, as chapters 3 and 8 suggested, then because mediumly typical exemplars were less likely to have been recently encoded these autobiographical memories may have been less available in memory: thus memory searches for the appropriate autobiographical memory of a mediumly typical exemplar took longer. Of course it might be countered that atypical exemplars are even less frequently encountered. Yet examination of the stimuli used in this experiment [see Appendix C] did not support this suggestion. Experiment 5, following, investigates this conjecture.

The findings from the interaction of imagery instructions by primes by typicality lend some support to the hypothesis that autobiographical and semantic memories were organized differently. Semantic memories were found to be organized in terms of typicality whereas there was no strong evidence that unprimed autobiographical memories were similarly organized. The findings tentatively suggested that autobiographical memories were, at least in part, organized in terms of recency of encoding and this issue is taken up in the following experiment.

Data from the post-experimental interviewed indicated that Ss had generally found image generation easy. However exemplars from the category weapon were singled out by Ss as being difficult to image. This was supported by the finding of a significant category effect in IGTs to weapons which were significantly slower than IGTs to all other categories. A categories by groups interaction also found that weapons in both PI and TI produced significantly slower IGTs. Possibly the emotional connotations of such exemplars inhibited imagery and/or Ss simply had little experience of such items and therefore poorly established semantic and autobiographical memories from which to generate images. Whatever the case it was decided that the category Weapon would not be included in future studies. Yet as the category effect did not interact with any variables other than groups it was concluded that this effect had not unduely effected the experimental manipulations. The category differences between the groups were taken as further indicating that Ss had indeed drawn upon different types of memory to generate their images.

9.5 Conclusions

The pattern of findings, although containing some unpredicted and contradictory effects, provided some support for the proposal that autobiographical and semantic memories differed in terms of the information that they represent. Perceptual primes facilitated typical instance image generation and inhibited personal instance image generation. These findings argued against the 'narrative conventions' criticism of experiment 3 and that criticism was rejected.

Further the pattern of findings relating to typicality, although also containing unpredicted and contradictory effects, lent some support to the hypothesis that autobiographical and semantic memories were differently organized. Semantic memories were found to be organized in terms of typicality whereas there was no clear cut evidence that autobiographical memories were similarly organized. The data tentatively suggested that autobiographical memories might be organized by recency of encoding.

Overall, the data were taken as supporting the hypotheses that autobiographical and semantic memories differed in terms of content and organization.

Experiment 5

Frequency of Experience Norms

9.6 Introduction

The purpose of this experiment was to investigate whether exemplars from different typicality levels had been, systematically, more or less frequently experienced: it was assumed that items which had been more frequently experienced were more likely to have been recently encoded and this assumption is discussed further below. It was hypothesised that the rated recency of experience of exemplars would be similarly distributed to the PI no-prime image generation times observed in experiment 4, above. The proposal that autobiographical memories were organized, at least in part, by recency would, then, receive additional, if indirect, support. However as the organization of autobiographical memories was only of secondary interest in this thesis it was felt sufficient to indicate rather than critically evaluate what form(s) such organization might take. This was also in keeping with the general research aim to provide an overall perspective on the distinctiveness, and connectedness, of auotbiographical and semantic memories, [see chapter 6].

One of the findings of experiment 4 was that unprimed personal instance image generation times [IGTs] exhibited a bow shaped typicality distribution: IGTs to highly typical and atypical exemplars were not significantly different from each other but both were significantly different from IGTs to mediumly typical exemplars. This was suprising given the unbiquitos finding that typicality enhances mental processes [c.f. Mervis and Rosch, 1981]. Examination of the stimuli suggested that mediumly typical exemplars naming common objects about which much would have been known but which were less likely to have been encountered recently by Ss, e.g. Hairband, Skates, Bow, Sailing, and so on. Related to this a post hoc analysis in experiment 3 had indicated that the majority of Ss personal instance images were images of objects and activities that had recently been experienced. It seemed probable, then, that recency of experience and the ability to generate personal instance images were related.

Evidence reviewed in chapter 3 strongly implicated recency as a factor in the retrieval of autobiographical memories. For example one of the most persistent findings in the study of autobiographical memory has been that more memories were recalled from more recent periods of a person's life, [Warrington and Silberstein, 1970; Warrington and Sanders, 1971; Corvitz and Schiffman, 1974; Baddeley and Hitch, 1976; Holland, 1976; Franklin and Holding 1977; Robinson, 1976; Rubin, 1982; see aslo Whitten and Leonard, 1981; Bahrick and Karis, 1982]. Whitten and Leonard [1981] reported that backward searches of autobiographical memory from most recent memories to temporally more distant memories was the strategey most frequently employed by their Ss, indicating that recent autobiographical encodings were prominent in the organization of the memory search. This evidence suggests that recent autobiographical encodings were more 'available' in memory than less recent autobiographical encodings. This would provide one plausible explanation of the finding that IGTs to unprimed personal images of mediumly typical exemplars were comparitively slow: the search for the appropriate memory would have taken longer.

Nevertheless investigations of autobiographical memory have not extensively studied the role of recency in autobiographical memory. Generally findings bearing on recency effects have been secondary to the research, as in the Whitten and Leonard study. Further there is an important though unacknowledged problem relating to the concept of recency as applied to autobiographical memory: in laboratory memory studies recency is usually specifically defined by the position of a target in a list but in everday memory recency of encoding is confounded with frequency of experience. In any given time span, items that have been most frequently encountered are, by definition, more likely to have been recently encoded. It is unclear whether the availability of a memory is a product of the frequency with which the memorized item has been encountered [and, therefore, encoded] or with the recency of the encoding. For instance a frequently encoded event such as going to the cinema, may not have been recently encoded yet may still be more available in memory than a less frequently but recently encoded event. Clearly this is a problem which must primarily be answered by research and, as such, lies outside the scope of the research aims of the present thesis. What seems clear from this discussion is that frequency of experience may determine recency of encoding.

It was decided to require Ss to rate how frequently they had encountered various objects, of differing typicality, in the immediately preceding month. It was assumed that objects rated as being frequently encountered were also more likely to have been recently encoded. It was predicted that mediumly typical exemplars would be found to be less frequently encountered than either highly typical or atypical exemplars. With the provisio mentioned above it could be argued that mediumly typical exemplars were less recently encoded and therefore less available in memory. This would shed light on the IGTs to unprimed mediumly typical exemplars.

9.7 Method

A single group of Ss were required to rate, on a 7-point scale, how frequently they had encountered objects that were highly typical, mediumly typical, and atypical, of 5 semantic categories.

Stimulus Selection

A short pilot study indicated that a list of 75 exemplars occupied Ss for an optimum amount of time.

The category Weapon was eliminated from the selection set because of the very slow IGTs given in response to exemplars from this category in experiment 4, which indicated the unavailabilty of both autobiographical and semantic memories of these exemplars. From the remaining set of 8 categories the following five were randomly selected: Vegetable, Clothing, Fruit, Furniture, Vehicle. Within each category 5 exemplars were selected from each of the three levels of typicality, highly typical, mediumly typical, atypical, as specified in experiment 4. Within typicality levels exemplars were matched for PI and TI imagability, items varying by no more than 1 in their ratings. The lowest imagery rating overall exemplars was 3.5 indicating that the selected exemplars were all easily imagible. At all typicality levels exemplars were eliminated from the selection set if it was intuitively felt that the object would have been extremely rarely or never encountered, e.g. 'collard' from the catgory Vegetable. Such alterations were rare. Five exemplars were then randomly selected from each category at each typicality level. Thus 15 exemplars from each of five categories were compiled into a stimulus list of 75 items, [see Table 9.2.1 in Results, below, for a complete stimulus list].

Subjects

40 Ss all full time members of the Open University adiministrative staff took part. There were 24 females and 16 males. Average age was 27 ranging from 19 to 37. 12 of these Ss had previously taken part in Experiment 3 some 10 months earlier. All were native English speakers and local residents.

Materials

Stimuli were printed in a four page booklet. Each exemplar was printed next to a list of 1 to 7 numbers. There were two pages each containing 30 exemplars and a final page containing 15 exemplars. A different random ordering of stimuli was generated for each S. The front page of the booklet contained the instructions to subjects.

Procedure

Ss took part in two groups of twenty each on successive days. Upon arrival at the laboratory Ss were seated in a large room well apart from each other. In front of Ss on a desk was the experimental booklet, face down, and a pen. When all Ss were seated E verbally instructed them to turn over and read the instructions and then to commence the experimental task. Ss who had queries were asked to raise their hand and E dealt with their questions individually. Finally Ss were told to work at their own pace and if they completed the booklet before others to sit quietly and wait until E indicated that the experiment was completed. Ss then read the following instructions: " This is a very simple experiment designed to find out how often we encounter various objects in our everyday lives. Over the page are a list of words and next to each word is a seven point rating scale. You are asked to indicate how frequently you have encountered each of the objects by ringing one of the numbers on the seven point scale. Specifically you are asked to indicate how frequently you have encountered particular objects in the last four weeks. Note that the object may have been directly encountered and/or you may have seen a picture of it in a magazine, book, or on television. However verbal descriptions of, conversations about, or reading the object name do not qualify as encounters with the actual object and should be discounted in this experiment. You are not, of course, expected to remember every time you encountered an object in the last four weeks, just use the rating scale to give as accurate impression as you can.

Ringing a '1' on the seven point scale means that you have encountered the object very frequently indeed, say almost everyday Ringing a '7' means that you have not encountered the object at all in the past month. Ringing a '4' means that you have occasionally encountered the object. Use the intermediate numbers, '2' and '3', to indicate that you have encountered certain objects slightly more frequently than others and use the numbers '5' and '6' to indicate that you have encountered some objects slightly less frequently than others. IT IS ESSENTIAL THAT YOU MAKE YOUR JUDGEMENTS AS FINE AS YOU CAN SO USE THE FULL RANGE OF THE RATING SCALE ".

Ss took about 8 minutes to complete the ratings and were paid 50 pence.

9.8 Results

Table 9.2.1 below shows the mean rating for each exemplar in each category and the standard deviation of that rating. Figure 9.2.1 plots the overall mean rating for each typicallity level in each category and Table 9.2.2 tabulates the corresponding standard deviations of the overall mean ratings for each typicality level in each category. Figure 9.2.2 plots the overall mean for each typicality level across categories. and Table 9.2.3 tabulates the standard deviations for each typicality level across categories. Internal reliabity of the ratings was assessed by two split-half correlations, one between a divison of Ss on the basis group ordering, and second by a random division of Ss. The respective Spearman rank correlation coefficients were rho= 0.736 and rho= 0.814 both of which were highly significant, $p<0.01$, indicating close agreement between

Table 9.2.1 Ratings of Frequency of Encountering Exemplars of Varying Typicality.

Category	Mean	S.D	
Vegetable			
Potato	2.15	1.42	
Cauliflower	4.60	1.42	Highly
Carrot	3.70	1.49	Typical
Brussel Sprouts	4.90	1.61	
Peas	4.10	1.94	
Corn	6.00	1.74	
Artichokes	6.65	0.98	Mediumly
Watercress	5.95	1.07	Typical
Asparagus	6.15	1.34	
Radishes	5.75	1.74	
Peanuts	3.45	1.46	
Rice	2.95	1.71	Atypical
Ruhbarb	5.95	1.18	
Pickle	4.20	1.60	
Baked Beans	3.40	1.76	

Category	Mean	S.D	
Clothing			
Jacket	1.70	1.12	
Shirt	1.50	1.20	Highly
Sweater	1.45	1.18	Typical
Skirt	1.85	1.26	
Suit	4.10	1.19	
Cape	6.25	1.40	
Nylons	3.20	2.46	Mediumly
Pyjamas	5.45	2.21	Typical
Parka	6.35	1.30	
Tie	4.70	2.25	
Handkerchief	3.25	2.31	
Watch	1.65	1.49	Atypical
Ring	1.45	1.14	
Earrings	2.65	2.30	
Purse/Wallet	1.60	1.26	

/Continued

Table 9.2.1 /Continued.

Category	Mean	S.D	
Fruit			
Apple	2.20	1.50	
Orange	3.00	1.70	Highly
Strawberry	6.55	0.85	Typical
Peach	6.10	1.37	
Pear	5.10	1.40	
Nectarine	6.90	0.44	
Cranberry	6.95	0.22	Mediumly
Avacado	6.00	1.71	Typical
Prunes	6.90	0.44	
Pommegranate	6.95	0.22	
Tomato	2.60	1.14	
Coconut	6.05	1.14	Atypical
Olive	5.95	1.19	
Pumpkin	6.80	0.41	
Mango	6.40	0.88	

Category	Mean	S.D	
Furniture			
Table	1.05	0.22	
Chair	1.00	-	Highly
Bed	1.05	0.22	Typical
Couch	2.35	2.05	
Desk	1.05	0.22	
Ottoman	6.80	0.41	
Piano	6.20	1.15	Mediumly
Closet	3.30	2.20	Typical
Lamp	3.20	3.08	
Magazine Rack	5.00	2.12	
Radio	1.00	-	
Telephone	1.00	-	Atypical
Ashtray	3.00	1.98	
Pillow	1.15	0.44	
Cushion	1.95	1.23	

/Continued.

Table 9.2.1 /Continued.

Category	Mean	S.D	
Vehicle			
Car	1.35	0.81	
Bus	3.40	2.25	Highly
Van	4.65	2.08	Typical
Taxi	4.55	1.90	
Bike	3.75	2.35	
Wagon	6.30	1.68	
Cable Car	6.90	0.44	Mediumly
Ship	6.30	0.98	Typical
Cart	6.50	0.88	
Tank	6.55	1.14	
Feet	1.20	0.62	
Horse	4.10	1.61	Atypical
Wheelbarrow	5.60	1.60	
Skateboard	6.40	0.94	
Skates	6.25	0.78	

Table 9.2.2 Standard Deviations of Frequency of Experience Ratings, Collapsed Within Typicality Levels, For Nine Categories.

Category	Highly Typical	Mediumly Typical	Atypical
Vegetable	1.07	0.34	0.60
Clothing	1.11	1.29	0.52
Fruit	2.02	0.41	1.68
Furniture	0.58	1.64	0.87
Vehicle	1.33	0.24	2.16

Table 9.2.3 Standard Deviations of Frequency of Experience Ratings, Collapsed Across Typicality Levels and Categories.

	Highly Typical	Mediumly Typical	Atypical
All Categories	1.55	0.81	1.79

Fig 9 2.1
Frequency of Experience Ratings,
Collapsed Within Typicality Levels,
for Nine Categories

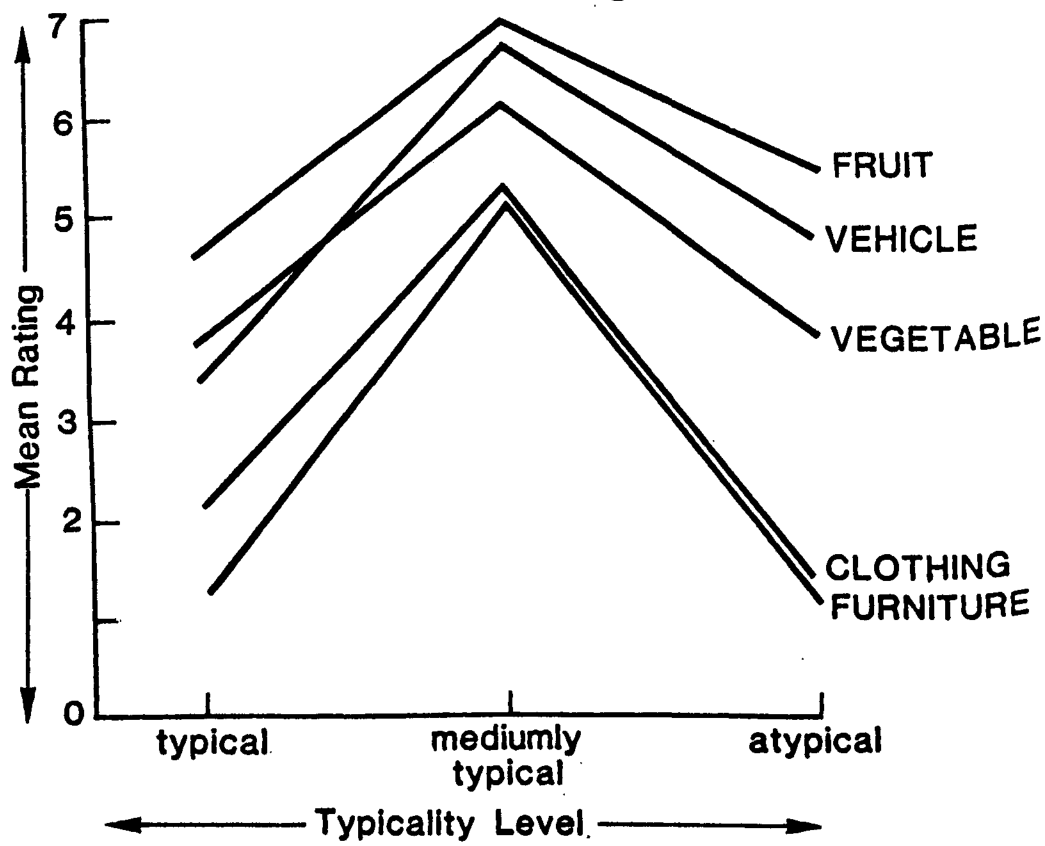
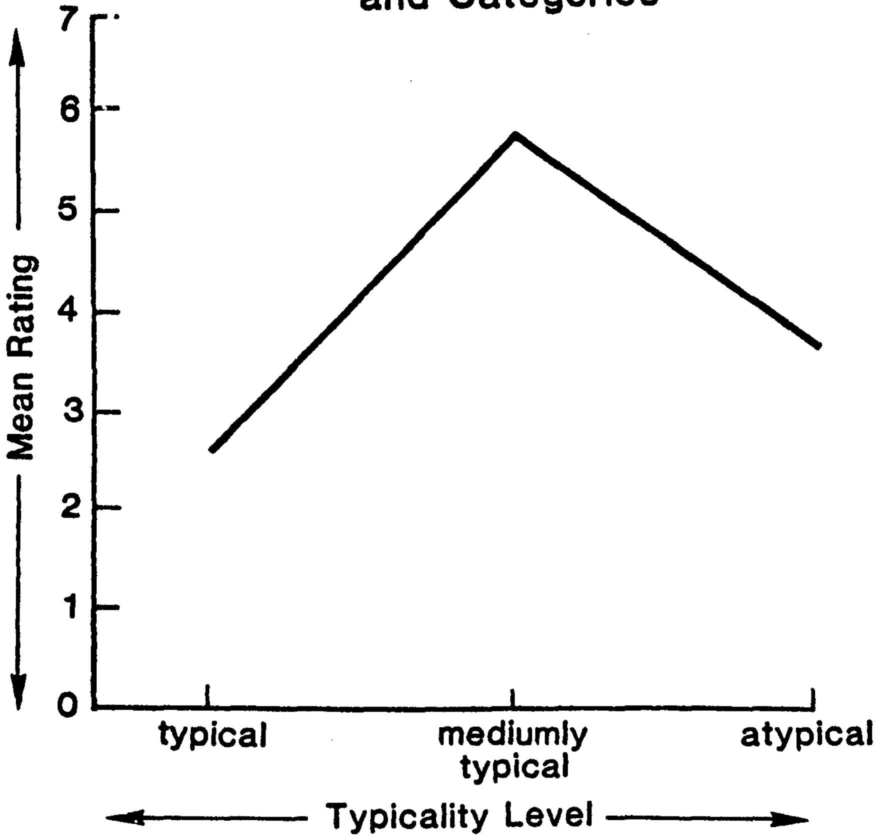


Fig 9 2.2
Frequency of Experience Ratings,
Collapsed Across Typicality Levels
and Categories



Ss ratings of the frequency with which they had encountered common everday objects over a four week period.

It is clear from Figures 9.2.1 and 9.2.2 that mediumly typical exemplars were rated as having been less frequently encountered during the preceding month than either highly typical or atypical exemplars.

9.9 Discussion

The prediction that mediumly typical items would be found to be less frequently encountered than either typical or atypical exemplars was confirmed [Figures 9.2.1 and 9.2.2]. This bow-shaped distribution of frequency ratings is clearly similar to that observed for IGTs to unprimed personal instance images in experiment 4 [see Figure 9.1.4, above]. The proposal that unprimed personal instance IGTs were a product of the availability of autobiographical memories is lent indirect support by this finding: autobiographical memories of mediumly typical exemplars were less available in memory because they were less frequently, and hence less recently, encoded.

However the standard deviations, listed in Tables 9.2.1, 9.2.2, and 9.2.3, showed that there was fairly high variability in the ratings. For example at most typicality levels, in all categories, there was, at least, one item which was rated either much higher or lower than the other exemplars at that typicality level. Hence the relatively high standard deviations at typicality levels. Also Figure 9.2.1 shows that different categories of objects were generally encountered more or less frequently. For instance items of Furniture and Clothing were encountered, generally, more frequently than items of Fruit, Vehicle, and Vegetable. The high split-half correlations indicated that this pattern of viabilitywas common to all Ss. The sources of the variance appeared to have their roots in common factors such as seasonal variations, e.g. the experiment was conducted in winter when Fruits such as Strawberry, Peach, and Pear, had been generally unavailable for sometime. Similarly uncontrolled for group differences in the subject sample may have led to item variability within typicality levels e.g. smokers are more likely to encounter ashtrays than non-smokers. The Ss sampled were predominantly non-smokers hence the high rating of 'ashtray'. Clearly frequency of experiencing an object, and hence recency of encoding, is itself determined by many other factors. Thus it could not be, [nor is it], maintained that recency of encoding, and hence availability of autobiographical memories, is only determined by frequency of experiences.

Further it is not claimed that recency is the sole determinant of the availablity of autobiographical memories. As discussed in chapter 3 emotions associated with the memory, the perceived consequences of the encoded event [Brown and Kulik], and many other factors, are evidently involved in the availability of autobiographical memories.

Further, recency may determine more than autobiographical memory availability. For example it has been argued that autobiographical memories become assimilated to semantic memories and in the process lose their distinctivenes and so, gradually, become irretrievable [see Chapter 3]. Thus there may be a graded hierarchy of content differences such that less recently experienced exemplars exhibit content more similar to that of semantic memories than recently encoded autobiographical memories. However until there is some account of how recent a 'recent' memory must be before it is assimilated and becomes irretrievable, or, additionally, until, there is some account as to whether or not latest encodings are preserved in lieu of subsequent encodings, then the function of recency in autobiographical memory generally remains unclear.

The claim made here is simply that recency plays some role in determing the availability of autobiographical memories. The high split-half correlations and the fact that every category exhibited the predicted bow-shaped distribution of ratings clearly showed that, in general, mediumly typical exemplars were less frequently encountered than typical or atypical exemplars. This provides some support for the proposal that the time taken to generate images drawn from autobiographical memories is a function of the availability of those memories. Autobiographical memories of typical and atypical exemplars were more available because those objects were more frequently and recently encountered than mediumly typical exemplars.

9.10 General Conclusions

Experiment 4 provided some support for the hypotheses, a] that autobiographical and semantic memories represent different classes of information, and b] that autobiographical and semantic memories were differently organized. It was concluded that semantic memories contained general perceptual information that was not present in autobiographical memories.

Experiment 4 also found that that semantic memories were represented in categories organized in terms of typicality. Additional evidence tentatively suggested that autobiographical memories might be organized at least in part in terms of recency of encoding and experiment 5 supported this suggestion. It was concluded that semantic memories were organized in semantic categories whereas auobiographical memories were not organized in such categories but were, partially, organized in terms of recency.

CHAPTER 10

VERIFYING ATTRIBUTES OF AND RECALLING AUTOBIOGRAPHICAL AND SEMANTIC MEMORIES

This chapter reports 3 experiments. Experiment 6 investigated the collection of locational and perceptual attribute norms. Stimuli employed in experiments 7 and 8 were taken from these norms. Experiment 7 replicated the no-prime condition from experiment 4 and investigated Ss abilities to verify different types of information from autobiographical and semantic memories. It was found that perceptual information was verified fastest when mediated by semantic memories and that locational information was verified more quickly when mediated by autobiographical memories. Experiment 8 investigated the cued recall of exemplars that had previously been imaged from semantic or autobiographical memories. It was found that perceptual cues facilitated recall of exemplars that had previously been imaged from semantic memories whereas locative cues facilitated recall of exemplars that had previously been imaged from autobiographical memories. These findings strongly supported the content hypothesis.

Experiment 6

Perceptual and Locative Attribute Norms for Nine Categories

10.1 Introduction

The main finding of experiments 3 and 4 was that of a marked content difference between autobiographical and semantic memories. To investigate this content difference further it was decided that additional stimuli would have to be gathered, particularly for autobiographical memory content. However the idiosyncratic nature of autobiographical memories indicated that comparisons between subjects would be particularly difficult. One solution to this problem was suggested by the findings relating to the locational content of autobiographical memories.

In experiment 3 it was observed that locational attributes contained in descriptions of PI images exhibited attribute overlap similar to that observed for perceptual attributes and similar to that reported by Rosch and Mervis [1975]. Locational attribute overlap, although not as marked as perceptual attribute overlap, suggested that locations were semantically represented and in experiment 3 it was argued that that semantic representations of locations are separate from autobiographical memories, [in the unitary memory network, see chapter 4] .

However, as autobiographical memories have been found to predominantly contain information about locations, it seemed likely that autobiographical memories may connect to corresponding semantic memories by way of semantic representations of locations. Thus autobiographical memories may be accessed via semantic memories containing information about locations. Further as locations were rarely if ever named either in TI descriptions in experiment 3 or in previous collections of attributes [Rosch and Mervis, 1975; Ashcraft, 1978; Hemenway, 1981], it seemed likely that the semantic representation of locations was separate from the representation of semantic categories and their perceptual attributes. It was reasoned then, that locational and perceptual attributes would differentially access autobiographical and semantic memories.

Two experiments investigating the relationship of locational and perceptual attributes to autobiographical and semantic memories respectively, are reported later in this chapter. The aims of the present experiment were firstly to gather normative information about locative and perceptual attributes to be used in the later experiments and, secondly to compare the structure of the norms and, hence, to further investigate the semantic representation of locations.

A common measure of semantic dominance or relatedness is the production frequency of attributes, [Glass, Holyoak, and O'Dell, 1974; Holyoak, Glass, and Mah, 1976; Nelson and Kosslyn, 1975; Rips, 1975; Ashcraft, 1976; 1978; Hampton, 1979], the higher the production frequency the more semantically related the attribute to the exemplar. Such production frequency norms typically show a pattern of centrality where a small number of attributes are closely associated with an exemplar while other attributes are rated as having decreasingly less association. As already noted Rosch and Mervis [1975] also found a characteristic pattern of feature overlap between superordinates and exemplars and amongst exemplars. With these observations in mind it was decided to gather production frequency norms of locational and perceptual attributes and compare their patterns of overlap. The aim was to investigate whether locational attribute norms were similar in structure to perceptual attribute norms. If so, this would support the hypothesis that locational attributes were semantically represented. As experiment 3 found that autobiographical memories predominantly contained information about locations, the finding that locations were also semantically represented would imply that one of the ways in which autobiographical memories connect to semantic memories is by way of semantic representations of locations.

It was decided, then, to collect production frequency norms of locational and perceptual attributes given in response to exemplars from a number of categories at different levels of typicality and given to the category name themselves. It was predicted that although there would be some variation in the absolute number of attributes listed to specific items this would not contribute to significant differences in the number of attributes listed at three typicality levels, typical, mediumly typical, and atypical, nor would there be significantly more attributes listed to different categories. It was also predicted [after Rosch and Mervis, 1975] that typical exemplars would have more attributes in common than mediumly typical or atypical exemplars [in that order]. Similarly it was predicted that typical exemplars would have more attributes in common with the superordinate than either mediumly typical or atypical exemplars [in that order]. Lastly it was predicted that attributes listed for superordinates would show minimal overlap. These predictions applied to both perceptual and locational attributes.

10.2 Method

Two independent groups of Ss were require to list either the preceptual attributes or the locations of a set of common items. Ss were randomly allocated to groups and stimuli were presented in a random order.

Stimulus Selection

The same stimulus set as that employed in experiment 4 [chapter 9] was used here. Two exemplars from each of three typicality levels, typical, mediumly typical, atypical, in each of nine categories were employed. Including the category superordinates there were 63 stimulus items.

Subjects

80 Ss took part. There were 67 females and 13 males with a mean age of 30.5 years ranging from 24 to 55. All Ss were Open University psychology undergraduates taking a second level introductory pschology course at a one week residential summer school held at Sussex University. All were native English speakers.

Materials

80 different random orderings of the stimuli were constructed and each ordering was printed in a 22 page booklet. Each page of the booklet contained three stimulus items separated by a space of about ten lines in which S was to write the attributes. The first page of the booklet contained instructions.

Procedure

Ss took part in two groups of 25, one group of 19, and one group of 11, over a two week period. Ss completed the listings in a large lecture theatre seated well apart. Upon arrival Ss were randomly assigned to one of the two experimental groups and administerd the appropriate experimental booklet, face down, and given a pen. When all the Ss were seated E instructed them to turn over and read the instructions. Ss then read the following instructions according to their experimental group:

A] Perceptual Attribute Lists

"This is a very simple experiment designed to find out what perceptual attributes people think of in response to some common everday objects. Perceptual attributes are generally the parts and features of objects. For example some of the perceptual attributes of Dog are 'tail, legs, furry, barks, runs, collar' and so on. In general, then, a perceptual feature is some sort of property of an object e.g. Furry, whereas perceptual parts are discernable bits of objects e.g. legs. Over the page are a list of 63 common objects, activities, and concepts, and you are asked to list as many perceptual attributes for each item as you can think of in a set time. Don't bother to try and separate the attributes you think of into groups like features and parts just write them down in any order. This is not any sort of creativity measure so refrain from listing unusual attributes at the expense of omitting more common ones. Although, of course, you should try to name as many attributes as you can. Also note that different individuals will mention different attributes so there are no 'right' or 'wrong' answers. Just complete it the way you see it.

When you have read these instructions raise your hand and wait for the experimeter's signal before turning the page and starting the experiment."

B] Location Lists "This is a very simple experiment designed to find out what locations people think common everday objects may be found in. For example a Dog might be found in "home, a kennel, a park, on a leash, in a cartoon, on a street, in front of the fire, by a lamp post" and so on. Over the page are a list of 63 common objects, activities, and concepts, and you are asked to list as many locations for each item as you can think of in a set time. This is not any sort of creativity measure so refrain from listing unusal locations at the expense of omitting more common ones. Although, of course, you should try to name as many locations as you can. Also note that different individuals will mention different locations so there are no 'right' or 'wrong' answers. Just complete it the way you see it.

When you have read these instructions raise your hand and wait for the experimeter's signal before turning the page and starting the experiment."

E then asked if there were any questions and these were answered individually so as not to be audible to other Ss. E then explained that Ss would be allowed 40 seconds per item and that everytime E said next "Next item" Ss must immediately move onto the next word. The experiment commenced when E said "Next word". E timed Ss with a stop watch. The whole experiment lasted about 1 hour. Ss were paid one pound.

10.3 Results

The perceptual attribute and locative attribute norms are contained in Appendix D. The norms for each category are distributed over 3 pages, the first page contains the the norm for the category superordinate, the second and third pages contain the norms for the exemplars ordered from most typical to least typical. The category norms are grouped in the order Weapon, Bird, Vegetable, Clothes, Fruit, Toy, Vehicle, Sport, Furniture. Each page contains the following information on successive lines: the word responded to; the rated typicality of the word, Typ; the mean number of responses per subject, X; internal reliability correlations for the frequency of response measure, r; followed by the actual attribute responses listed in order of decreasing production frequency; each response is accompanied by the absolute frequency measure A, expressed as a percentage. Responses generated by only one subject are not presented.

Random split-half correlations were performed for each norm and it can be seen that in both perceptual and locative attribute norms the Pearson correlations were high, averaging r=.668, S.D.=0.15, r=.674, S.D.=0.14, respectively. Lower correlations occured when a high proportion of attributes were emitted by only two or three Ss. Given the relatively small number of Ss that took part in each group [n=40] a higher production frequency criteria would have had the effect of dramatically raising the correlations at the expense of eliminating a large number of responses.For example raising the production frequency criteria to 4 [i.e. 4 subjects must name that attribute for it to be included in the split-half correlation] dramatically raises the locative attribute correlation for Pyjamas from 0.38 to 0.69. Ashcraft [1976] reported a similar effect in his property norms. Overall the split-half correlations showed close inter-subect agreement concerning attributes with higher production frequencies.

Frequency A is a measure of how many Ss gave a particular attribute as a response. For example 62.5% of Ss named 'webbed feet' as a perceptual attribute of Duck i.e. 25 of the 40 subjects. As mentioned earlier this sort of production frequency measure is often taken as a measure of semantic relatedness, [e.g. Ashcraft, 1976; Glass, Holyoak, and O'Dell, 1974; Rosch and Mervis, 1975].

The mean, X, records the absolute mean number of responses per subject, including attributes named only once. Approximately 25% to 40% of attributes were named only once.

Two 9 by 4 chi squares, categories by superordinate, typical, mediumly typical, and atypical, levels were performed for each group. The means of the absolute frequencies of properties were entered in each cell. No significant chi squares were observed indicating that similar numbers of attributes were listed at superordinate, typical, mediumly typical, and atypical, levels in all categories within both groups. The means were then collapsed across categories and entered in a 2 by 4 chi square, groups by superordinate, typical, mediumly typical, atypical, levels. No significant chi squares were found indicating that, although slightly more locative attributes were named than perceptual attributes, similar numbers of attributes were named in both groups at all stimulus levels.

Table 10.1.1 Locative Attribute Overlap of Pairs of Exemplars At Three Typicality Levels For Nine Categories, [in percentages].

Category	Typical Exemplars	Mediumly Typical Exemplars	Atypical Exemplars
Weapon	23.8	6.2	5.5
Bird	63.2	9.1	31.5
Vegetable	59.2	25.9	20.6
Clothes	57.7	25.0	13.0
Fruit	56.5	39.1	33.3
Toy	63.6	15.7	0
Vehicle	33.3	4.1	17.3
Sport	21.1	5.8	0
Furniture	31.8	20.8	39.8

Table 10.1.2 Peceptual Attribute Overlap of Pairs of Exemplars At Three Typicality Levels For Nine Categories, [in percentages].

Category	Typical Exemplars	Mediumly Typical Exemplars	Atypical Exemplars
Weapon	44.4	25.5	20.0
Bird	62.5	21.7	28.5
Vegetable	50.0	25.0	28.5
Clothes	36.8	12.5	5.2
Fruit	45.5	25.0	11.1
Toy	28.5	5.3	0
Vehicle	32.1	19.2	50.0
Sport	25.9	5.2	0
Furniture	24.5	35.0	9.5

Table 10.1.3 Locational Attribute Overlap of Pairs of Exemplars At Three Typicality Levels For Nine Categories With Their Superordinates, [in percentages].

Category	Typical Exemplars	Mediumly Typical Exemplars	Atypical Exemplars
Weapon	40.9	6.8	27.2
Bird	40.5	30.9	14.2
Vegetable	69.0	40.5	23.8
Clothing	60.5	36.8	13.2
Fruit	59.1	43.2	29.5
Toy	47.5	17.5	15.0
Vehicle	50.0	5.5	5.5
Sport	23.5	16.6	13.8
Furniture	41.1	20.5	29.4

Table 10.1.4 Perceptual Attribute Overlap of Pairs of Exemplars At Three Typicality Levels For Nine Categories With Their Superordinates, [in percentages].

Category	Typical Exemplars	Mediumly Typical Exemplars	Atypical Exemplars
Weapon	38.2	5.8	2.9
Bird	55.2	28.9	26.3
Vegetable	41.6	22.9	12.5
Clothing	35.0	21.4	2.3
Fruit	50.0	23.8	16.6
Toy	22.5	7.5	2.5
Vehicle	47.7	18.8	0
Sport	35.4	0	0
Furniture	31.2	14.5	12.5

Table 10.1.5 Locational Attribute Overlap Between Superordinates [in percentages].

	W	B	Vg	C	Fr	T	Vh	S	Fu
[W] Weapon	-								
[B] Bird	5.0	-							
[Vg] Vegetable	0	5.0	-						
[C] Clothing	0	0	2.7	-					
[Fr] Fruit	0	9.5	14.2	2.3	-				
[T] Toy	0	5.2	5.2	11.4	5.2	-			
[Vh] Vehicle	0	0	2.9	2.9	2.9	2.9	-		
[S] Sport	0	5.8	2.9	0	0	2.9	0	-	
[F] Furniture	0	0	6.2	6.2	6.2	6.2	0	0	-

Table 10.1.6 Perceptual Attribute Overlap Between Superordinates [in percentages].

	W	B	Vg	C	Fr	T	Vh	S	Fu
[W] Weapon	-								
[B] Bird	0	-							
[Vg] Vegetable	0	0	-						
[C] Clothing	0	2.5	2.5	-					
[Fr] Fruit	2.1	2.1	15.2	2.1	-				
[T] Toy	2.6	2.6	0	2.6	2.6	-			
[Vh] Vehicle	2.3	0	0	0	0	0	-		
[S] Sport	0	0	0	2.1	0	0	0	-	
[Fu] Furniture	4.2	2.1	2.1	6.3	4.1	10.5	0	2.1	-

To examine attribute overlap counts were made of the number of attributes in common between exemplars at each of the three typicality levels in each of the nine categories. Also a count was made of the number of attributes shared by exemplars, at each each typicality level, and the superordinate. This was done for both perceptual and locative attributes. Tables 10.1.1 and 10.1.2 show the count of exemplar attribute overlap, expressed in percentages, for perceptual and locative attributes respectively. [All counts of attribute overlap are expressed in percetages as each norm contained slightly more or less attributes]. Tables 10.1.3 and 10.1.4 show the count of superordinate and exemplar attribute overlap, for locative followed by perceptual attributes, also expressed in percentages.

Finally a count was made of attribute overlap between superordinates. Tables 10.1.5 and 10.1.6 represent the superordinate attribute overlap count, in percentages, for perceptual and locational attributes respectively.

10.4 Discussion

The results supported the prediction that locational attributes would exhibit a pattern of attribute overlap similar to that of perceptual attributes and that both patterns of overlap would be similar to that found by past work [Rosch and

Mervis, 1975]. Overall typical exemplars had many attributes in common whereas mediumly typical and atypical exemplars had considerably less attributes in common, see Tables 10.1.1 and 10.1.2, and this was the case for both locational and perceptual attributes. However it can be seen from Table 10.1.1 that this pattern was reversed for perceptual features given to exemplars from the category Vehicle and atypical exemplars showed more common attributes. This is probably a function of the low number of exemplars sampled [two] at each typicality level. In experiment 4 five exemplars were studied at highly typical and atypical levels and in no instance did attribute overlap at the atypical level exceed attribute overlap at the typical level although that experiment required descriptions of images of objects rather than the listing of attributes. In a study that did require the listing of attributes Rosch and Mervis [1975], who sampled five exemplars at these typicality levels, found that typical exemplar attribute overlap far exceeded atypical exemplar attribute overlap. Thus it is likely that the pattern of attribute overlap observed for perceptual attributes in the category Vehicle is the exception rather than the rule. A similar unpredicted pattern of attribute overlap was evident for locational attributes given to exemplars from the category Furniture, Table 10.1.2. and it is suggested that this also is an exception. If more exemplars had been sampled then attribute overlap at the typical level would have inceased whereas as attribute overlap at the atypcial level would have, proportionally, decreased.

In additon to exemplar attribute overlap a count was made of exemplar-superordinate attribute overlap, Tables 10.1.3 and 10.1.4, and these clearly show that typical exemplars have more attributes in common with the superordinate than mediumly typical or atypical exemplars. This was the case for all categories and for both perceptual and locational attributes.

Also a count was made of attributes common to superordinates, Tables 10.1.5 and 10.1.6.. Attribute overlap was negliglible for both percepual and locative attributes at this level. This then supports Rosch and Mervis's [1975] finding that superordinates had few common attributes.

The split-half correlations indicated close agreement between subjects. There were no extreme differences in the naming of perceptual and locational attributes. Similarly no significant differences were found in the production frequencies of either type of attribute at differing typicality levels and in differing categories. Thus production frequency per se was not a determining factor in attribute overlap.

Taken together the two measures of attribute overlap, exemplar-exemplar and exemplar-superordinate, clearly indicated that typical exemplars shared more perceptual and locational attributes with each other and with the superordinate than exemplars of lower typicality. Mediumly typical and atypical exemplars shared some, but comparatively few, perceptual and locational attributes with each other and with the superordinate. These findings relate equally to locational and perceptual attributes. Subjects then clearly treat locations in much the same way as perceptual attributes strongly suggesting that the latter attributes may be represented semantically.

However these findings do not establish the specific organization of the underlying representations but rather, suggest its general nature. In chapter 4 it was observed that perceptual attributes had been found to be organized within semantic categories, although this had been established not only by studying production frequency norms but also by other experiments such as property verification experiments [Ashcraft, 1976; Hampton 1979], and multidimensional scaling studies [Smith, Shoben, Rips, 1974]. In the light of past work and given the present findings it is reasonable to conclude that perceptual attributes are organized in overlaping sets as stated in the general model of categorization outlined at the close of chapter 4. In the case of locational attributes, while they ressemble perceptual attributes in their production frequency, no firm conclusions as to to their representation can be drawn without further research. The research on script-like semantic representations, reviewed in chapter 4, found that locations may be clustered in memory around certain common actions. Thus the overlap between locational attributes may reflect the commonnality of actions undertaken in locations rather than the structure of semantic categories of objects. Examination of the locational attribute norms indicated that locations common to exemplars, particularly at the highly typical level, denoted locations in which similar activities were undertaken e.g. eating, buying, and cooking, for Vegetables. It is concluded that although perceptual and locational attributes exhibited similar patterns of overlap, suggesting that both were semantically represented, the underlying parameters of this pattern of overlap for the two classes of attributes may be different. These issues are taken up in chapter 11 which contains three multi-dimensional scalling studies of locational and perceptual attributes.

The important point to emerge from this study was that, as autobiographical memories had been found to predominantly contain information about locations [experiment 3], it seems likely that autobiographical memories are connected to semantic structures in which locational attributes play a dominant role. Thus autobiographical memories of common items may be more directly associated with the semantic system via semantic structures representing locations rather than via their corresponding categorical semantic representations.

Experiment 7

Verifying Attributes of Autobiographical and Semantic Memories

10.5 Introduction

An obvious follow up to experiment 4 would have been a priming experiment employing contextual rather than perceptual primes. The predictions of such an experiment would be a the mirror image of those in experiment 4: contextual primes should facilitate the generation of personal instance images and inhibit the generation of typical instance images. However, for various reasons, this was not deemed feasible: firstly it was difficult to assess what sort of material, which did not include the actual item, might have acted as a contextual prime; secondly, as autobiographical memories may not be organized categorically, each item would have required an individual prime thus logistically complicating the experiment and rendering it less comparable with experiment 4; thirdly the actual display depicting a context would have constituted a visually more complex stimulus than the picture primes used in experiment 4, introducing yet another new variable. For these reasons then it was decided not to undertake a contextual priming experiment.

However one way to experimentally investigate the contents of the two clases of memory, was to have Ss verify different classes of attributes that were more or less associated with different classes of memory. It is predicted that the verification of contextual attributes would be facilitated by the activation of autobiographical memories and inhibited by the activation of semantic memories whereas the verification of perceptual attributes would be facilitated by the activation of semantic memories and inhibited by the activation of autobiographical memories.

To investigate this hypothesis it was decided to have Ss generate personal and typical images of objects and subsequently to verify attributes of the objects [as opposed to attributes of the image of the objects]. It was reasoned that if S were required to answer questions about what was generally true of the object [rather than of his/her image of the object] then the time taken to verify a statement would be a measure of the information contained in the image and/or associated information activated in memory during the course of image generation. Thus the image would act as a prime to verification. For instance: S generates a personal instance image of 'Potatoes' and subsequentally has to verify the statement "are sold in a greengrocers'". This statement may be directly verified from the image if, for example, S has imaged potatoes on display in a greengrocers' shop. In addition the statement may be verified by S searching semantic memory. If semantic representations of locations were more closely connected to autobiographical memories than to semantic memories then in both cases the statement should be verified faster when a personal instance image has been generated than when a typical instance image as been generated. This line of reasoning suggested a number of hypotheses but before considering these in detail some related issues must be briefly discussed.

Kosslyn [1980; Chapter 9] reported that when answering true/false questions about objects Ss used both imagery and propositional representations. Kosslyn argued that processes operating on these two types of representation run in competition and whichever process 'finishes first' supplies the information used in making a judgment. However information which was highly overlearned was found to be more likely to be processed propositionally. Information that was less well learned was more likely to receive imaginal processing. Thus in Kosslyn's experiments Ss reported generating more images to harder-to-evaluate than easier-to-evaluate questions, e.g. "a dog has ears" was more likely to lead to an image of a dog than "a dog has four legs". To avoid Ss employing propositional processing when verifying locational and perceptual attributes in this experiment it was decided to employ attributes which were frequently but not the most frequently given in the attribute norms reported in experiment 6. The reasoning was that slightly less frequently named attributes would be less likely to be overlearned and therefore less likely to give rise to propositional processing.

One further issue relates to the nature of verification tasks. In property or category verification tasks it is often assumed that the verification time is a function of variables such as cognitive proximity, similarity, between the stimulus and target, [Meyer 1974; Collins and Quillian, 1972; Collins and Loftus, 1975; see Chapter 4]. However this is only the case for 'true' responses. Glass, Holyoak, and O'Dell [1974] found that false responses were mediated by heuristics, [chapter 4] and thus did not reflect the underlying structure of semantic memory as directly as true responses. Because the present experiment was chiefly concerned with the differential association of classes of attributes with classes of memory only true responses were analysed. Heuristics although of intrinsic interest were beyond the scope of the present study.

Lastly, as Ss were to generate an image and then verify an attribute of that image, two measures were taken, image generation time [IGT] and attribute verification time [AVT]. The IGT measure was a replication of the no-prime condition in experiment 4.

The following hypotheses were investigated:

1] Image Generation Times [IGTs]

IGTs would be fastest for personal instance imagers and would show a 'V' shaped typicality distribution where IGTs to highly typical and atypical exemplars would be fastest and IGTs to mediumly typical items would be slowest. Typical instance imagers would generally show slower IGTs than personal instance imagers with fastest IGTs being given to typical items followed by mediumly typical items and slowest IGTs being given to atypical items. Thus an interaction of imagery instruction and typicality, similar to that observed in the no-prime condition in experiment 4, was predicted.

2] Attribute Verification Times [AVTs]

The personal instance imagers would exhibit faster AVTs to locational than perceptual attributeas whereas typical instance imagers would show faster AVTs to perceptual rather than locational attributes. Also it was predicted that there would be no overall differences between attributes or between groups. Thus an interaction of attribute type and imagery instruction was predicted. Lastly it was predicted that there would be no effect of typicality on the AVT variable, [once activated retrieval of associated information should be equally fast at all typicality levels].

10.6 Method

The two dependent variables, image generation time IGT and attribute verification time AVT [both measured in milliseconds], received different treatments and were analysed separately.

Image Generation Times A 2 between by 6 by 3 by 2 within Ss repeated measures design was employed. The between groups factor was imagery instruction, IG. Ss generated either personal or typical instance images, PI, TI. The within groups factors were categories, C, of which there were six, Vegetable, Bird, Fruit, Sport, Furniture, and Clothing; Typicality levels, T, of which there were three, typical, mediumly typical, and atypical; and two exemplars, E, from each typicality level. Thus Ss imaged a complete set of 36 exemplars. This design was repeated four times on separate occasions each three or four days apart. Ss were randomly allocated to groups and the order of presentation of exemplars was determined by the AVT design, below.

Attribute Vertification Times A 2 between by 2 by 2 by 6 by 3 by 2 within Ss design was employed. The between groups factor was IG. The first within groups factor was the attribute statement, true or false. The second within groups factor was attribute type, AT, which were either locational or perceptual attributes. The remaining within groups factors were C, T, and E. Ss, then, verified four attributes for each exemplar in four sets of 36, one on each occasion. The four sets were: 36 true perceptual attribute statements; 36 false perceptual attribute statements; 36 true locational attribute statements; and 36 false locational attribute statements. The order of presentation of attribute statements were counterbalanced as follows:

The six categories were randomly divided into two groups which were, A] Furniture, Fruit, and Clothing, B] Bird, Vegetable, Sport. In two of the presentations of the 36 exemplars group A] were paired with true attribute statements and Group B] with false attributes statements. In the remaining presentations this order was reversed. Within the false and true groupings the categories were split into pairings with locational attribute statements or perceptual attribute statements: To achieve this ordering categories were randomly divided within typicality levels. For example the categories Furniture, Fruit, and Clothing, each represented by 6 exemplars, 2 at each of the 3 levels of typicality, were divided into two sub-groupings of 3 exemplars, with one exemplar at each of the three typicality levels. One sub-grouping was paired with true locational attribute statements and one with true perceptual attribute statements. The categories Bird, Vegetable, and Sport, were divided in the same way with the exception that they were paired with fasle attribute statements. Reversing the true/false pairings and the locational/perceptual pairings produced the four sets of 36 exemplars each balanced for categories, typicality levels, true/false statements, and locational/perceptual attributes.

Within the set of 36 exemplars attribute statements were randomly presented. Each S was randomly allocated one of the 10 possible [4!] orderings of the 4 sets of 36 stimuli.

Subjects

24 Ss, 16 females and 8 males, aged between 19 and 42 years with a mean age of 27 [to nearest year], took part. Ss were members of the Open University academic and administrative staff. All were native English speakers.

Stimulus Selection

A] Exemplars: six categories were randomly selected from the group Furniture, Fruit, Clothing, Vegetable, Sport, Bird, Vehicle, Toy: the latter two categories were eliminated. [Note that the category Weapon had previously been dropped from the stimulus set because of extreemly slow IGTs observered in Experiment 4 to exemplars drawn from this category]. The exemplars were those employed in experiment 4. There were 36 exemplars in all, 2 from each of the 3 typicality levels in each of the six categories, [see appendix B]

B] Attribute Statements: the true attribute statements were selected from the attribute norms reported in experiment 6 [see appendix D]. Attributes were selected if it was felt that they would be unlikely to be overlearned. As there was no normative data on the topic of overlerning this aspect of the stimulus selection was neccessarily intuitive. Selected attributes tended to be from the top five most frequently named attributes to a given exemplar but were not usually the most frequently named. All attributes were prefaced by three or four words, e.g. "kept in a wardrobe" [Jacket]. Attribute statements were either 4 or 5 syllables in length. False attribute statements were identical with the exception that the false attribute was generated by the experimenter. The criteria for a fasle attribute was that it should complete a plausible but false statement, e.g. "is worn on shins" [Jacket]. The central criteria for both true and false statements was that they named attributes which were <u>generally</u>, rather than absolutely, true or false. A complete list of attribute statements is contained in Appendix D.

C] Practice Items: 12 exemplars and 6 false and 6 true attribute statements were selected and constructed from the categories Toy and Bird; two exemplars from each typicality level.

Stimulus Construction

A] Exemplars: the digitized exemplars that had been employed in experiment 4 were used.

B] Attribute Statements: an identical digitization procedure to that employed in experiment 6 for exemplars was applied to attribute statements. The digitized statements were edited to homogenize length and enhance clarity. The shortest statement was 77.3 seconds and the longest was 82.1.

Apparatus

A response box containing two response keys set 100mm apart and labeled True [right hand key] and False [left hand key] was used. A set of stereo headphones and stereo amplifier were employed. All the apparatus was controlled from a PDP 11 computer running RSX 11M, which also measured and recorded Ss responses. The software for this experiment was written by Dr. M Levoi of the Open University Psychology Unit.

Procedure All Ss took part individually and upon arrival at the laboratory were randomly allocated to one of the two imagery instructions groups and one of the presentation orders. It was explained to Ss that they would be required to attend for a further 3 sessions each 3 or 4 days apart. 2 Ss could not commit themselves to this aspect of the experiment and a further 2 Ss were recruited. Ss were seated in a small room. The room contained a table upon which were the headphones, response box, and printed instructions. It was explained to Ss that the experimental procedure would be demonstrated for them after they had read the instructions and that they would have plenty of opportunity to practice the procedure before undertaking the experiment proper. Ss then read the following instructions according to their imagery group:

A] Personal Instance Imagers:

"This study is concerned with the mental images we can bring to mind of everyday objects and activities, such as items of furniture, articles of clothing, sporting activities, and the like. You will hear a word naming a common object or activity and YOU ARE ASKED TO FORM A VIVID MENTAL IMAGE OF A PERSONAL INSTANCE OF THE NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE. This means that you should try to form an image of an actual object or activity with which you are personally familiar. For example if the named object were BICYCLE you would form an image of a personal instance of a bicycle and so might bring to mind an image of, say, a tandem bicycle that you personally own. With something less common such as ASHTRAY you might bring to mind an image of an ashtray recently seen in a pub or shop.

To reiterate: YOU ARE ASKED TO FORM A VIVD MENTAL IMAGE OF A PERSONAL INSTANCE OF A NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE. You will be asked to indicate when you have done this by pressing a button.

As soon as you indicate that you have formed the personal instance image an aspect of that object or activity will be named to you. For example, if you had formed an image of a BICYCLE you might have named to you the phrase "HAS HANDLEBARS". Your task is to indicate, by pressing yet another button, whether this is generally true or false of the object. Note that this may not be true of your image but may be true of the object. YOU MUST JUDGE WHETHER THE PHRASE IS TRUE OF THE OBJECT. Note also that you must judge not whether the phrase is <u>absolutely</u> true but whether it is <u>generally</u> true. As it is generally the case that bicycles have handlebars you would answer true. If the phrase had been "IS MADE OF COTTON" you would, of course have answered false.

In summary: YOU ARE ASKED TO GENERATE AN IMAGE OF A PERSONAL INSTANCE OF AN OBJECT AS QUICKLY AND CLEARLY AS YOU CAN. AS SOON AS YOU HAVE DONE THIS SOME ASPECT OF THAT OBJECT WILL BE NAMED TO YOU. YOU MUST VERIFY WHETHER THIS ASPECT IS GENERALLY TRUE OR GENERALLY FALSE OF THE <u>OBJECT</u>, ALSO AS QUICKLY AS YOU CAN..

You will find that the task is, in fact, very easy and that your images will generally contain the information that you need to make your judgment."

B] Typical Instance Imagers:

"This study is concerned with the mental images we can bring to mind of everyday objects and activities, such as items of furniture, articles of clothing, sporting activities, and the like. You will hear a word naming a common object or activity and YOU ARE ASKED TO FORM A VIVID MENTAL IMAGE OF A TYPICAL INSTANCE OF THE NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE. This means that you should try to form an image that typifies that object or activity. For example if the named object were BICYCLE you would form an image of a typical instance of a bicycle despite the fact that you personally own or like tandem bicycles and thus might find if easy to form an image of a tandem. With something less common such as ASHTRAY you would bring to mind an image Of a typical instance of an ashtray rather than, say, an image of an esoteric and very ornate ashtray that you recently saw in a china shop.

To reiterate: YOU ARE ASKED TO FORM A VIVD MENTAL IMAGE OF A TYPICAL INSTANCE OF A NAMED OBJECT OR ACTIVITY AS QUICKLY AS POSSIBLE. You will be asked to indicate when you have done this by pressing a button.

As soon as you indicate that you have formed the typical instance image an aspect of that object or activity will be named to you. For example, if you had formed an image of a BICYCLE you might have named to you the phrase "HAS HANDLEBARS". Your task is to indicate, by pressing yet another button, whether this is generally true or false of the object. Note that this may not be true of your image but may be true of the object. YOU MUST JUDGE WHETHER THE PHRASE IS TRUE OF THE OBJECT. Note also that you must judge not whether the phrase is _absolutely_ true but whether it is _generally_ true. As it is generally the case that bicycles have handlebars you would answer true. If the phrase had been "IS MADE OF COTTON" you would, of course have answered false.

In summary: YOU ARE ASKED TO GENERATE AN IMAGE OF A TYPICAL INSTANCE OF AN OBJECT AS QUICKLY AND CLEARLY AS YOU CAN. AS SOON AS YOU HAVE DONE THIS SOME ASPECT OF THAT OBJECT WILL BE NAMED TO YOU. YOU MUST VERIFY WHETHER THIS ASPECT IS GENERALLY TRUE OR GENERALLY FALSE OF THE _OBJECT_, ALSO AS QUICKLY AS YOU CAN.

You will find that the task is, in fact, very easy and that your images will generally contain the information that you need to make your judgment."

The following procedure was then verbally explained and demonstrated to all Ss: "You will be seated in this room with the lighting slightly dimmed. You will be wearing the headphones and on the table in front of you will be the response box. You should place your right thumb on the right hand response key and your left thumb on the left hand response key. [N.B. By coincidence all Ss were right handed so it was not neccessary to adapt the procedure to left handers]. You will hear a 'beep' over the headphones which indicates that you are about to hear a word naming an object that you must image. As soon as you have formed the image press both buttons on the response box simultaneously. As soon as you do this you will hear a phrase naming some aspect of the object: PRESS THE RIGHT HAND KEY TO INDICATE THAT YOU THINK THE PHRASE IS GENERALLY TRUE OF THE OBJECT OR PRESS THE LEFT HAND KEY TO INDICATE THAT YOU THINK THE PHRASE IS FALSE. There will then be a 5 second rest period before the whole cycle starts again with a different word and different phrase. There will be 36 words in all and the experiment will take about 5 minutes."

Ss then undertook 12 practice trials. Ss were encouraged to close their eyes, or to 'project' on to a wall, to enhance their imaging. Having completed the practice and understood the experiment Ss then undertook the experimental trials.

After completing the first experimental run Ss were booked to return on three separate occassions 3 days apart. In fact this was not convient for all Ss and some completed their trial 4 and/or 3 days apart. Ss were told that subsequent trials would be similar but were led to believe that the stimuli would be slightly different on each occassion. Upon commencing each trial all Ss reread their imagery instructions and followed the above procedure. Ss were paid 50 pence each time they completed an experimental run.

10.7 Results

1] Image Generation Times [IGTs]

The data were log transformed. A repeated measures analysis of variance, where IG was the between groups factor and C, T, and I, were within groups factors, was undertaken over the four times [TM] Ss had completed the experiment. There was no significant overall TM effect nor were any significant TM interactions observed. It was also noted that I did not reach significance on any of the four trials. The data, then, were collapsed across TM. A further analysis of variance was undertaken on the collapsed data to establish whether the data could be further collapsed across I. No significant effect of I was observed nor was I part of any significant interactions. Thus the data were further collapsed across I and this had the effect of up-grading T to the fastest changing within groups variable. As typicaliy is a fixed effect [Rosch, 1975(b)] this obviated the need to calculate quasi-F ratios.

A 2 between [IG] by 6 [C] by 3 [T] within groups analysis of variance was performed on the collapsed data. A highly significant effect of IG was found, $F=6.5$, D.F. 1,23, $p<0.0173$: IGTs were fastest in the personal instance imagery [PI] instruction group, 1367.37ms, and slower in the the typical instance imagery group [TI], 1727.ms. Thus the hypothesis that PI would show faster IGTs than TI was confirmed. A highly significant effect of T was observed, $F=10.99$, D.F. 2,32, $p<0.001$, and IGTs at typical, mediumly typical, and atypical, levels were, 1478.3ms, 1611.01ms, and 1552.387, respectively. A highly significant interaction of T with I was also found, $F=6.4523$, D.F. 2,34, $p<0.017$, and this is depicted in Figure 10.2.1, [over page]. This finding replicates the results of the no-prime condition in experiment 4 and strongly confirms the hypothesis that PI imaging gives rise to IGTs that do not show the predicted typicality effect whereas TI imaging does show the predicted typicality effect. Lastly a significant C effect was observed, $F=2.36$, D.F. 5,115, $p<0.041$. The mean IGTs for each category, in ascending order, were: Furniture 1481.82ms, Vegetable 1491.08ms, Clothing 1550.69ms, Fruit 1553.36ms, Bird 1589.63ms, Sport 1616.40ms. However this C effect did not interact with other variables and simply indicated that some categories contained exemplars that were more easy to image than exemplars from other categories regardless of typicality level and type of imagery.

2] Attribute Verification Times [ATVs]

Only ATVs to true attribute statements were analysed. The data were log transformed. A repeated measures analysis of variance, where IG was the between groups factor and AT [attribute type], C, T, and I, were within groups factors, was undertaken over the four times [TM] Ss had completed the experiment. [Note that as false attribute statements had been eliminated there were only 18 ATV per TM]. There was no significant overall TM effect nor were any significant TM interactions observed. It was also noted that neither T nor I reached significance on any of the four trials. The data, then, were collapsed across TM. A further analysis was performed to determine whether the data could also be collapsed across T and I. As no significant effects were found in this second analysis the data were collapsed across T and I.

A 2 between [IG] by 2 [AT] by 6 [C] within, groups analysis of variance was performed on the collapsed data. No significant effects of IG or AT were found. However a significant cross-over interaction of IG by AT was observed, $F=5.98$, D.F. 1,20, $p<0.024$, and this is illustrated in Figure 10.2.2 [over page]. Thus the predicted interaction was

Table 10.2.1 Attribute Verification Times to Locational and Percetual Attributes In Different Categories.

	B	S	C	Fu	Fr	V
L	2100	2095	2019	2008	2144	2135
P	2196	2191	2178	2038	2141	2100

[L=Locational Attributes, P=Perceptual Attributes
B=bird, S=sport, C=clothing, Fu=furniture,
Fr=fruit, V=vehicle]

Fig 10 2.1

Imagery Instructions by Typicality Interaction

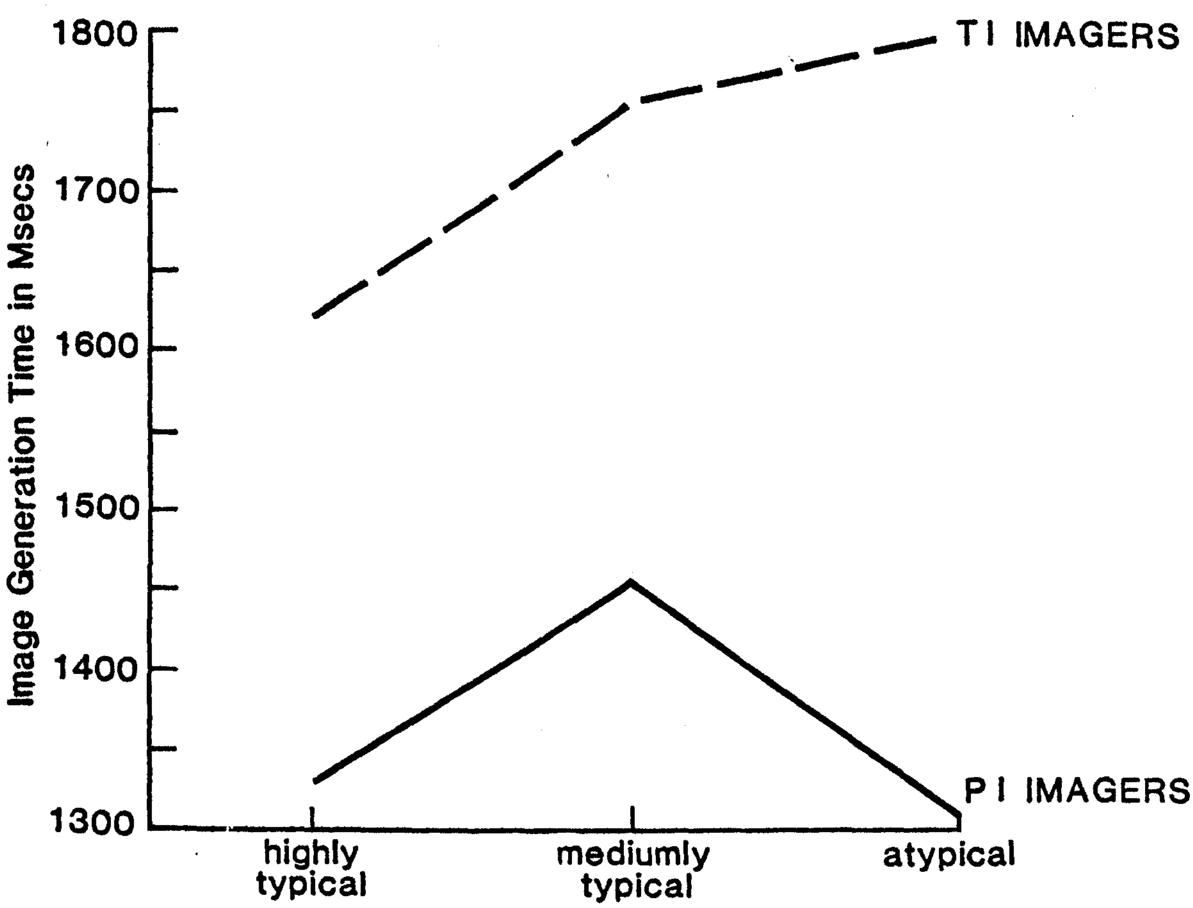
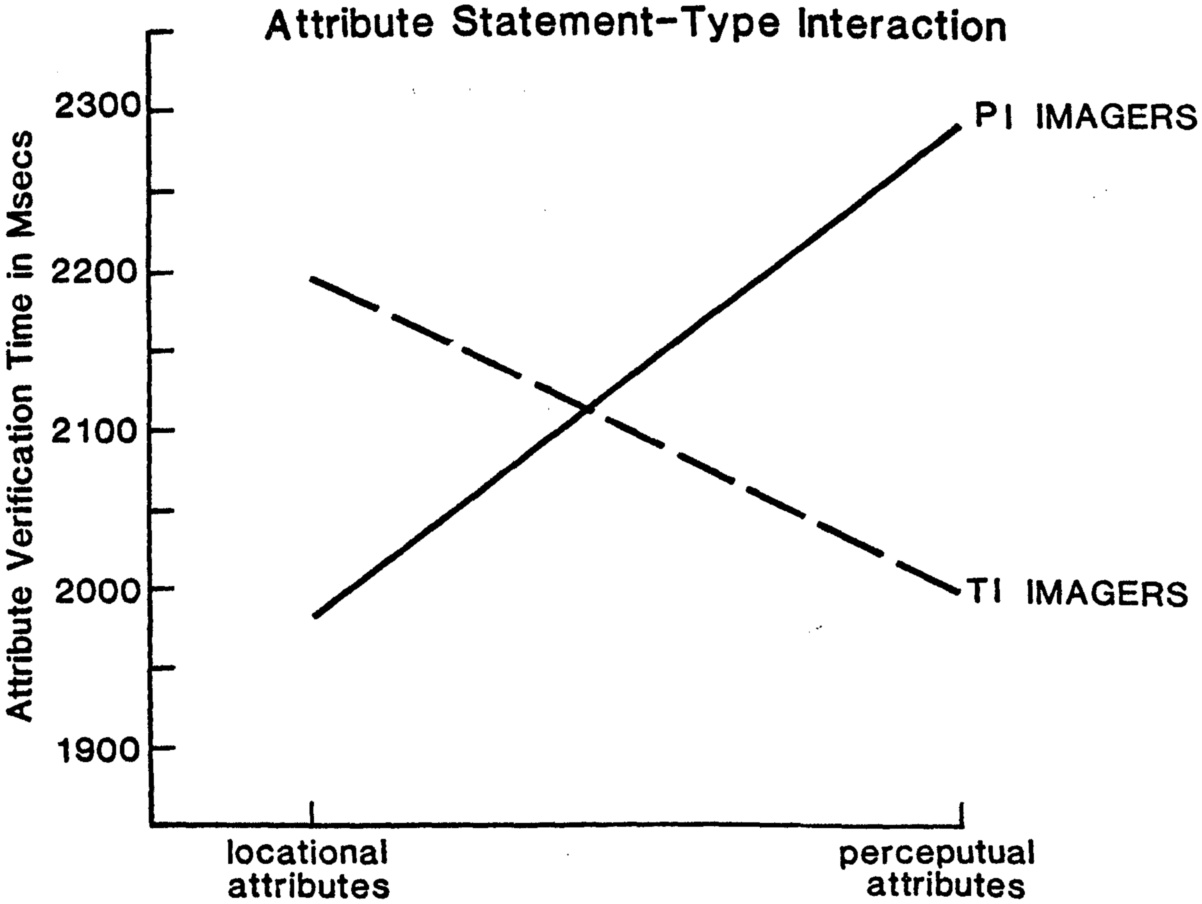


Fig 10 2 .2
Imagery Instructions by
Attribute Statement-Type Interaction



confirmed and the hypothesis that locational attributes would be verified faster than perceptual attributes in PI, and that this effect would be reversed in TI, was supported. No significant effect of C was observed. However an interaction of C by AT fell just outside significance, $F=2.16$, D.F. 5,100, $p<0.08$, and this is tabulated in Table 10.2.1 [below]. The near significance of this interaction suggested that certain categories may be more or less dominated by locational or perceptual attributes.

10.8 Discussion

The prediction that image generation times [IGTs] would be significantly faster for personal instance imagers [PI] in comparison to typical instance imagers [TI] was confirmed. The prediction that TI imagers would exhibit increasing IGTs with decreasing typicality but that PI imagers would show fastest IGTs to typical and atypical exemplars and slower IGTs to mediumly typical exemplars, was supported. These two findings replicate the findings from the no-prime condition in experiment 4.

The finding that PI IGTs were faster than TI IGTs further supported the argument fowarded in experiment 4 that autobiographical memories were literal encodings [Kosslyn, 1980] which were directly realizable as images, whereas semantic memories were imaged by a process of construction in which attributes of the imaged object were 'read' individually into the image. Thus in the abscence of prior activation [e.g. a prime] typical instance images took longer to generate than personal instance images. [Implications of this proposal are considered in more detail in chapter 12].

The IG by T interaction further supported the hypothesis that autobiographical and semantic memories were differently organized. In TI IGT was a function of typicality indicating that Ss searched semantic categories from typical to least typical members in order to retrieve the data required to generate the image, [this also indicates that Ss were in fact generating images drawn from semantic memory]: whereas access to autobiographical memories was faster but only for exemplars which had been frequently and recently encountered. Mediumly typical exemplars which, see experiments 3, and 4, may have been less frequently and less recently encountered, and therefore were less available, gave rise to slower IGTs. Taken together these two fingings lend further support to the hypothesis that semantic memories are organized in semantic categories and that autobiographical memories are organized, at least partly, in terms of recency.

The hypothesis that autobiographical memories would facilitate judgments about locational, but not perceptual, attributes and that semantic memories would facilitate judgments about perceptual, but not locational, attributes was confirmed. Figure 10.2.2 depicts the interaction of attribute type and imagery instruction: semantic memories either contained, or made more available, information about the perceptual attributes of objects; autobiographical memories either contained, or made more available information about the locations in which objects may be found. Also, as attribute types did not differ significantly overall, it was concluded that both types of attribute were equally verifiable, given the appropriate memory. However it was not clear from this finding whether it was the different content of the two classes of memory or the memories to which the two classes of memory were differentially connected that differentially facilitated the verification of the two types of attribute. The findings of fast TI IGTs to picture primes in experiment 4 indicated that semantic memories content [perceptual attributes] facilitated verification of perceptual attributes in the present experiment. Similarly the finding in experiment 3 that descriptions of PI images predominantly contained information about locations suggested that this information would have acted to facilitate the verification of locations in the PI condition in the present experiment. Yet it seems unlikely that, in every case, PI and TI images would have depicted locational and perceptual attributes which matched exactly with the to-be-verified attribute. It may have been that in a number of cases an exact match did occur but, as the selected attributes were <u>not</u> the most frequently named in the attribute production frequency norms collected in experiment 6, it is unlikely that exact matches occured in the majority of cases. It is, therefore, tentatively proposed that these findings were partly attributable to content differences between the two classes of memory and partly attributable to the preferential connections between the two classes of memory. Semantic memories are seen as connecting most directly to semantic categories and autobiographical memories as connecting most directly to representations of locations, which are presumably semantic.

It was concluded that the findings lent further support to the hypotheses that autobiographical and semantic memories differ in terms of content and organization. It was also, but more tentatively, concluded that these findings lent some support to the proposal that autobiographical memories may be connected to semantic representations of locations.

Experiment 8

Recalling Autobiographical and Semantic Memories

10.9 Introduction

Experiments 3, 4, and 7, found content differences between autobiographical and semantic memories. These experiments were concerned with investigating the nature of the hypothesised content differences. In contrast the present experiment was concerned with investigating the effect of the previously observed content differences upon Ss recall of autobiographical and semantic memories. This was part of the general research strategy [see chapter 6] which was to investgate autobiographical and semantic memories through a process of convergent operations. The hypothesis, drawn from experiment 7, was that perceptual attributes would be more effective cues to the recall of previously imaged semantic memories than locative attributes and that locative attributes would be more effective cues to previously imaged autobiographical memories than perceptual attributes.

It was decided to employ the image generation paradigm previously used. Ss would be required to generate either personal [PI] or typical instance [TI] images of exemplars of varying typicality. Subsequently Ss would be cued with locational and perceptual attributes in a multi-cue recall test. It was also decided to employ cues which named two attributes of the exemplar. For instance Bicycle would be cued with 'handlebars/wheels' [perceptual] and 'shed/road' [locational]. The two attribute cue was employed to ensure that all cues were unique. It would have been both time consuming and difficult, if not impossible, to have constructed a set of single attribute cues.

However it was apparent that this experimental design only assessed recall of episodic memories. Since both PI and TI images are stored as episodic traces of the encoding phase of the experiment, it is the recall of episodic memories which the cues facilitate, or fail to facilitate. Yet this is not a fatal design flaw for, it is reasoned, as episodic memories are 'records of the cognitive environment' [Tulving, 1983] then they differentially contain some record of the areas of memory activated during encoding. On the basis of the findings from the previous experiments it was evident that TI episodic traces would be dominated by semantic categories and, to some lesser extent, by other semantic structures to which such categories connect. PI episodic traces would primarily contain autobiographical memories and, also to a lesser extent, some record of connected semantic structures activated during encoding.

The experiment does not then, directly examine the two classes of memory but rather examines their episodic 'recoding' [Tulving, 1983]. Thus any differences in recall only highlight differences between autobiographical and semantic memories in so far as the recodings preserve the nature of the underlying memories. The significance of this problem is offset by the fact that experiments 4, 7, and to a lesser extent experiment 3, more directly investigated the underlying memories: the hypotheses to be introduced below are drawn from these earlier experiments and so should be sensitive to the major differences between the two types of episodic encoding.

A further issue related to typicality. In experiments 4 and 7 it was found that the retrievability of TI images varied with the typicality of the imaged item. Less typical exemplars took more time to retrieve, presumably, because semantic memory was searched by categories and the categories were searched from most to least typical members. Similarly Rosch [1975] reported that, in suprise free recall, highly typical exemplars were more frequently recalled than either mediumly typical or atypical exemplars. In the Rosch experiment Ss recalled exemplars about which they had previously made a series of semantic judgments indicating that they most probably were drawing on an episodic trace containing semantic representations of exemplars. It is predicted that TI imaged highly typical exemplars will be more frequently recalled than mediumly typical and atypical exemplars in that order: however this effect will be facilitated significantly more by perceptual than by locational cues. It was further considered that locational cues may act to misdirect the memory search at recall thus eliminating the predicted typicality effect in this condition.

It was predicted that the semantic typicality effect considered above would not be present in the PI condition. The findings from experiments 4 and 7 showed that autobiographical memories were not organized in terms of typicality. However it was not clear, from the previous findings, whether PI images of exemplars would be more of less frequently recalled at highly typical, mediumly typical, and atypical, levels. This issue, then, was left open. On the basis of the findings in experiment 7 it was also predicted that PI imaging would lead to greater recall when cued by locative cues than perceptual cues.

The following hypotheses were investigated:

1] Imagery Instructions and Cue Type

It was predicted that locational cues would facilitate the recall of exemplars drawn from autobiographical memories in comparson to perceptual cues. Conversely it was predicted that perceptual cues would facilitate the recall of exemplars drawn from semantic memories in comparsion to locational cues. Thus an interaction of cue type and imagery instruction was predicted. It was predicted that there would be no overall differences in cue type independently of imagery instruction or in imagery instruction independently of cue type.

2] Typicality

It was also predicted that there would be an interaction of typicality and imagery instruction group where typical instance imagers would recall highly typical items most frequently and mediumly typical and atypical items less frequenty. It was not clear what sort of typicality pattern personal instance imagers would show in their recall although it was predicted that this would be different from typical instance imagers. Thus an interaction of imagery instructions and typicality was predicted.

3] Finally it was predicted that these effects would combine in a three way interaction of imagery instruction group by cue type by typicality, indicating the interactive effect of different memory class, different content, and, different underlying organization of autobiographical and semantic memories.

10.10 Method

The following design was employed: a 2 between by 2 by 2 by 8 by 3 within; where the between groups factor was imagery instructions [IG], personal [PI] or typical [TI] instance imagery; the first within groups factor was whether the cued exemplar had been part of the encoding set or not [TST]. This factor was included to check for guessing; The second within groups factor was cue type [CT], locational [L] or perceptual [P] cues; The third within groups factor was categories [C] of which there were 8, Clothing, Fruit, Toy, Bird, Vehicle, Vegetable, Sport, Furniture; the fourth within groups factor was typicality [T] of which there were 3 levels, highly typical [HT], mediumly typical [MT], and atypical [AT]. Thus in any one group Ss generated 24 images and saw 96 cues at recall, 48 of which were comprised of 24 L and 24 P cues of the imaged exemplars, and 48 of which were 24 L and 24 P cues of exemplars which they had not seen or imaged at encoding.

The whole of this design acted as a repeated measure for two completely different groups [G] of Ss. The two groups of Ss imaged different exemplars at encoding. The first group imaged the exemplars that the second group were cued with but did not image and the second group imaged the exemplars the first group were cued with but did not image. The exemplars were the same as those used in experiment 7, two from each level of typicality. Thus two complementary sets of 24 exemplars [each of the 8 categories being represented by 3 exemplars from HT, MT, and AT, typicality levels] were constructed in a manner similar to that employed in experiment 7. The purpose of the repeated measures factor was to asses whether items might be collapsed within typicality levels and so eliminate the need to calculate quasi F ratios.

The independent variables were G, IG, TST, CT, C, T. The dependent variable was amount recalled. Ss were randomly allocated to groups G and IG. There were 19 Ss in each of the four groups. Presentation of stimuli was random. Each S received a different random ordering of cues at recall.

Subjects

76 Ss took part. Their ages ranged from 24 to 56 years with a mean of 32 years, [to nearest year]. All Ss were third level Open University students attending a weeks' residential psychology summer school at Sussex University. Ss were sampled over 2 weeks. All Ss were english speaking nationals.

Stimuli

The stimuli for encoding were the same as those used in experiment 4 with the exception that the category Weapon was omitted. Two groups of 24 items were constructed as in experiment 7. In additon to this 12 filler items, highly imagable exemplars were selected from categories other than those used in the experiment. 6 fillers were located at the begining of the stimulus list and 6 at the end. Thus there were 36 encoding stimuli, 24 experimental and 12 filler.

The cues were drawn from the list of perceptual and locational norms reported in experiment 6 [see appendix D]. The two attributes were drawn from the top six attributes listed to that exemplar. The only restrictions being that the eventual cue [attribute pair] should be distinctive and unique and that across cues repetition of individual attributes should be kept to the barest minimum. 96 cues were constructed, 48 L and 48 P.

Black and white slides were made of all stimuli and these were mounted on Kodak carousel slide binders [24mm by 36mm]

Apparatus

A Kodak carousel SAV 2000 adapted for projection tachistoscopic displays was employed. Timing of slide presentation was controlled by a Forth's Instruments pulse generator [single pulse]. Ss were provided with a booklet on each separate page of which was printed a cue.

Procedure

Ss took part in groups of six and seven. Ss were seated in a large lecture theatre and read the following instructions, depending on allocation to IG:

A] Personal Instance Imagers: the instructions were the same as those issued in the first part of experiment 7.

B] Typical Instance Imagers: the instructions were the same as those issued in the first part of experiment 7.

Ss were then verbally told that the word naming each item that they had to image would be flashed up on the screen at the front of the lecture hall for 5 seconds. Ss were also told that there would be a two second pause in between words and that there would be 36 words in all. Any questions Ss had were answered at this point. Each group of 6 or 7 Ss received a, predetermined, different random order of presentation of stimuli. The lights in the lecture hall were then dimmed and the first part of the experiment commenced. E retreated to the back of the hall.

The encoding stage completed Ss were then issued with the booklets containing the cues and given the following verbal instructions:

" On each page of the booklet given to you is a cue designed to aid you in recalling the image you formed of particular items. The cue names two aspects of an item. For example if the imageed item had been Bicycle then cues such as 'handlebars/wheels' and 'shed/road' would be used. You will find that some of the cues are very powerful aids to recall while others are less effective and yet others provide no help at all. The distribution of very helpful, less helpful, and poor cues is about equal. Note that all the items you imaged are cued more than once. Read each cue carefully and if it reminds you of an image you formed then write down the name of the imaged item in the space below. If the cue does not help you remember then score a line through that page. If in doubt then guess but try to keep your guessing to a minimum. You have 5 minutes to complete this part of the experiment. "

Having completed this phase of the experiment Ss were then asked to briefly answer the following questions:

"Did you find it difficult to generate images ?"

"Briefly indicate what your images were like, e.g. highly detailed, fuzzy, black and white, coloured, etc."

"Briefly indicate the area from which your images were drawn e.g. Home, Work, Leisure, Books, Films, T.V., etc."

Having completed the third phase of the experiment Ss were paid one pound. The whole experiment took, about, 25 minutes.

10.11 Results

To assess for guessing the amount falsely recalled to cues for unencoded items was totalled. In both groups this amount was less than 4%. Thus it was judged that guessing effected only a small number of reponses and this variable was dropped from the subsequent analyses of variance.

A 2 by 2 between by 2 by 8 by 3 within groups factors repeated measures analysis of variance was undertaken. G was the first between groups factor and constituted the repeated measures variable. IG was the second between groups factor. The within groups factors, from fastest to slowest moving, were: cue type [CT] either L or P; categories [C]; typicality [T], [Note that in this analysis n=19]. No significant effects of G were observed and the data were pooled across groups. [It was also noted that C did not contribute any significant effects. However some small but non-significant differences between categories were present and it was decided not to collapse over this variable].

An identical analysis of variance was undertaken with the exception that the repeated measures factor G was ommitted. [Note that in this analysis n=38].

1] Imagery Instructions and Cue Type

A highly significant interaction of IG by CT was observed, $F=113.74$, D.F. 1,74, $p<0.0000$, and this is illustrated in Figure 10.3.1, over page. Note that neither IG or CT individually reached significance. Thus the hypothesis that recall would be a function of type of imagery and type of cue was strongly supported.

2] Typicality and Imagery Instructions

A highly significant effect of T was observed, $F=34.02$, D.F. 2,148, $p<0.0000$. Highly typical exemplars were recalled more frequently than all other exemplars [HT 57.4%, MT 41.7%, AT 46.5%]. However a highly significant interaction of IG and T was, also, observed, $F=19.9$, D.F. 2,148, $p<0.0000$, and this is illustrated in Figure 10.3.2. Therefore the finding that highly typical exemplars were recalled most accurately overall is qualified by the subsequent finding that atypical items were recalled as accurately as highly typical items in PI. Thus recall at different typicality levels was found to be a function of imagery instructions.

3] Typicality and Cue Type

A highly significant interaction of CT by T was observed, F=49.12, D.F. 2,148, p<0.0000, and this is illustrated in Figure 10.3.3. This latter finding indicated that perceptual attributes cues facilitated the recall of typical exemplars whereas locative attributes cues facilitated the recall of atypical exemplars.

4] Imagery Instructions, Cue Type, and Typicality.

A highly significant triple interaction of IG by CT by T was observed, F=19.5, D.F. 2,148, p<0.0000, and this is illustrated in Figure 10.3.4. This finding showed that cues inappropriate to type of imagery [L to TI, and P to PI], abolished typicality effects and generally reduced recall <u>in both groups</u>: whereas cues appropriate to type of imagery [L to PI, and P to TI] promoted predicted typicality effects in PI and TI. In PI mediumly typical exemplars were least well recalled.

These findings support the hypotheses that autobiographical and semantic memories differ in terms of both content and organization.

Fig 10 3 .1
Imagery Instructions by Cue-Type Interaction

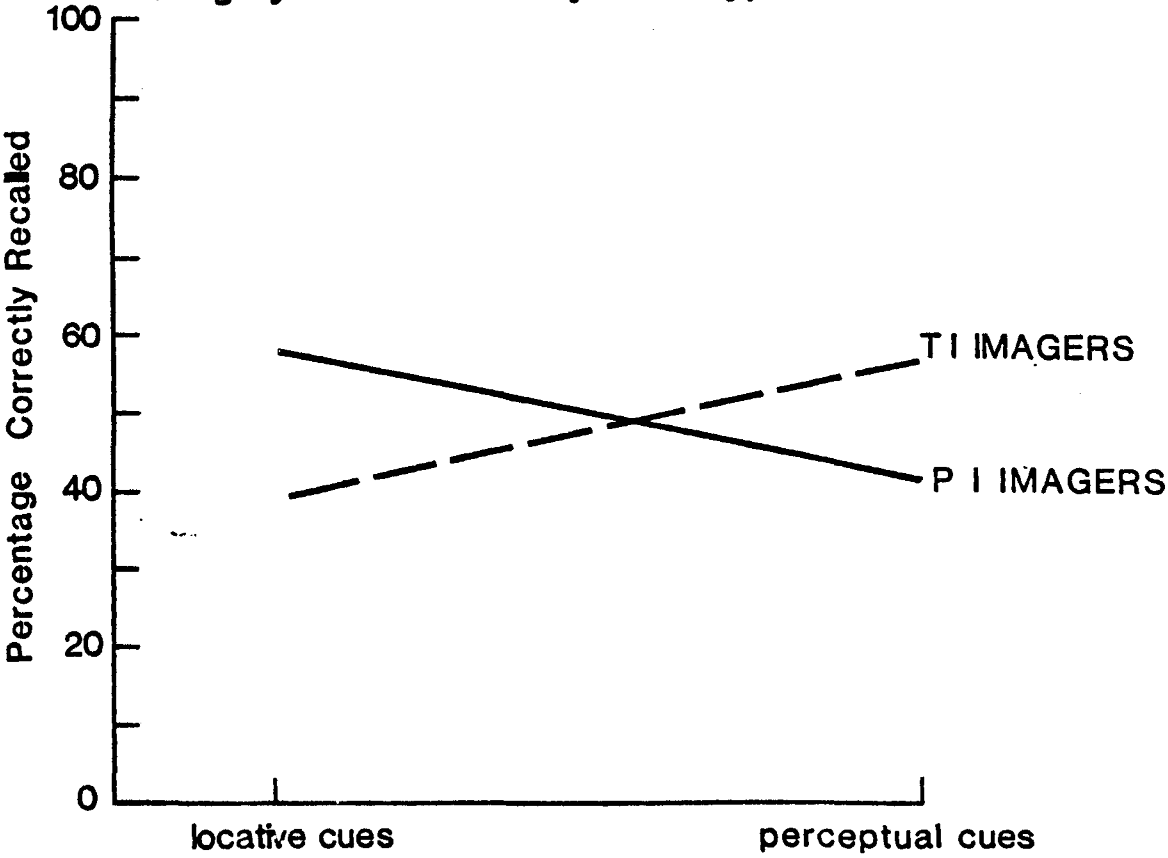


Fig 103 .2

Imagery Instructions by Typicality Interaction

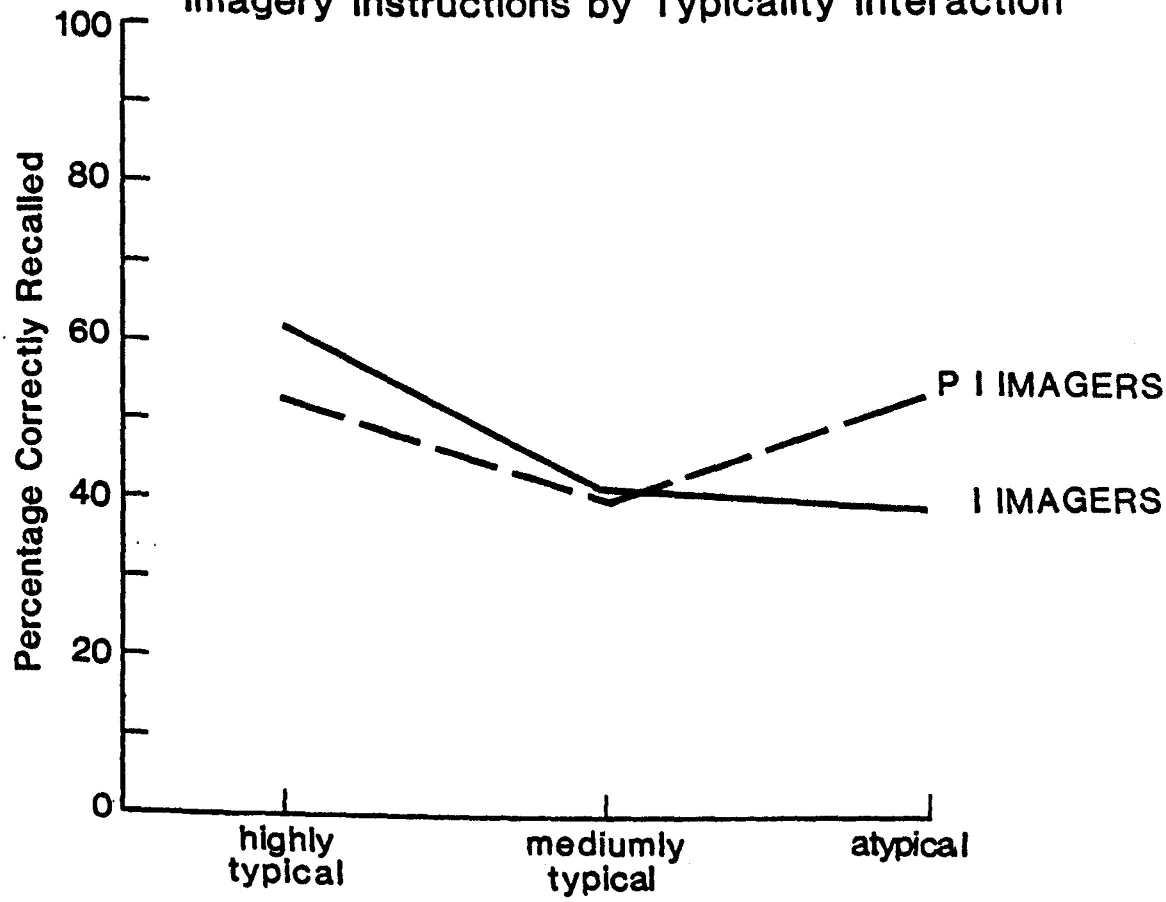


Fig 10₃ .3

Cue-Type by Typicality Interaction

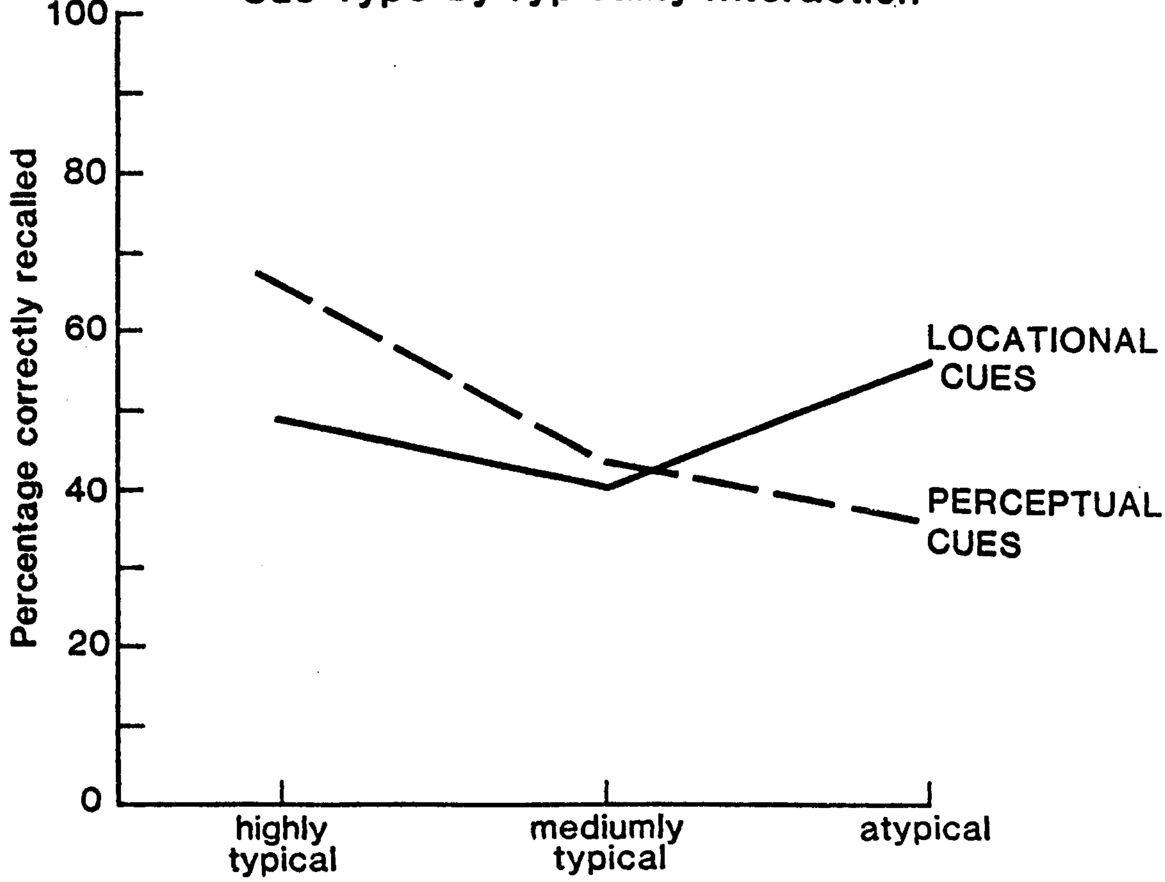
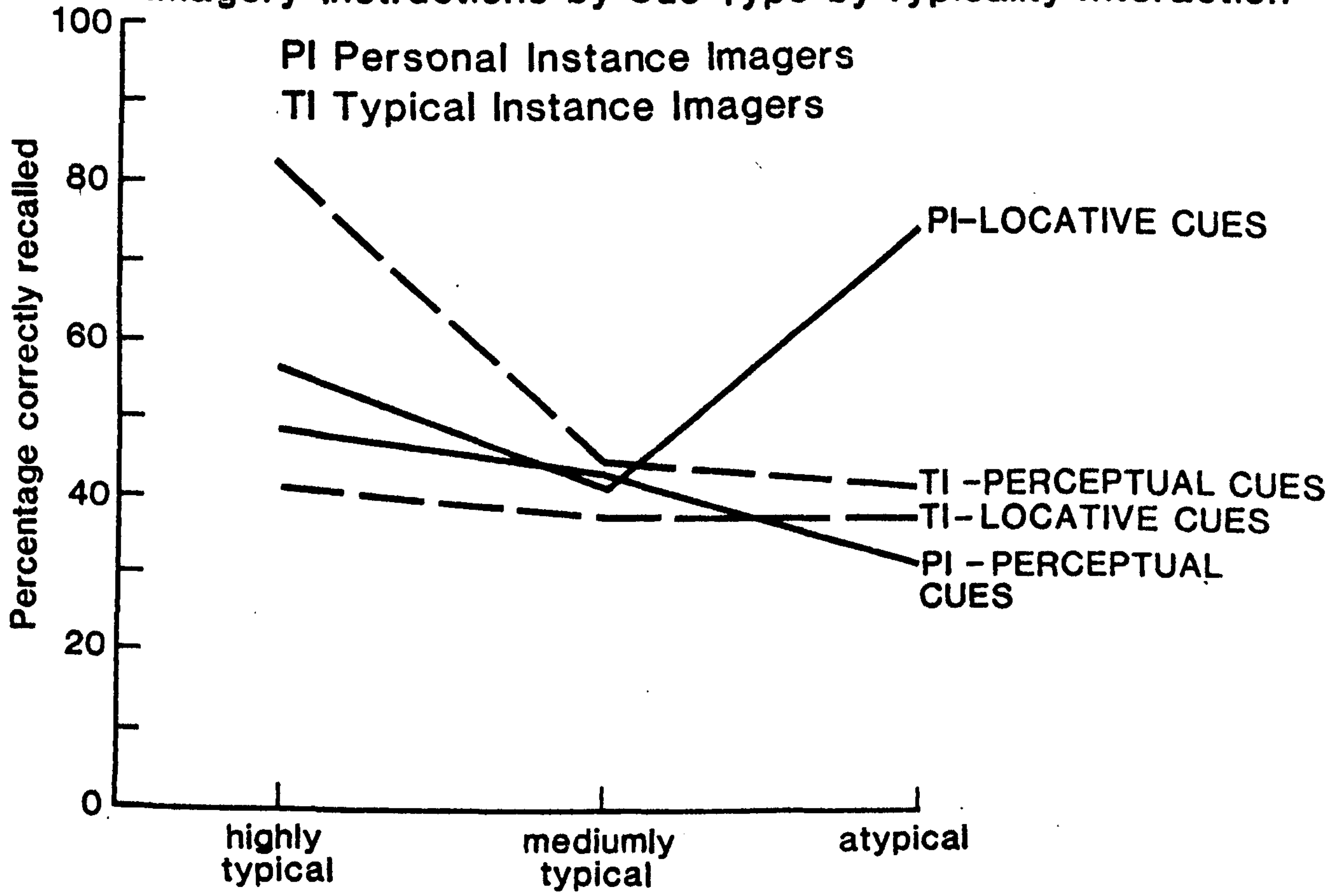


Fig 10 3 .4

Imagery Instructions by Cue-Type by Typicality Interaction



No other effects were significant.

[Results from of the post-experimental questions indicated that few Ss had problems in generating images and all claimed to have formed all images. About 5% of Ss claimed that their images were highly unstable and only remained clear for a very short time].

10.12 Discussion

The first main finding illustrated in Figure 10.3.1 clearly confirmed the prediction that autobiographical memories would be best cued by locational attributes whereas semantic memories would be best cued by perceptual attributes: location cues facilitated PI recall more than TI recall whereas perceptual cues facilitated TI recall more than PI recall. This then, confirmed that the two classes of memory differed in terms of content. However a problem also noted in experiment 7 is that it is unclear whether it was the information contained in the image which facilitated cueing or other information activated during the course of image generation but not directly depicted in the image. The discussion of this issue in experiment 7 also applies here: PI images activated autobiographical memories and closely connected semantic memories of locations, TI images activated semantic categories and other closely related semantic structures [e.g. script-like semantic representations], and it was this information that was contained in the respective episodic traces. [Note that recall in the inappropriate cue conditions was about 45%, in both TI and PI, suggesting that recall of the imaged items was either equally inhibited by inapproprpiate cues in both TI and PI or that the cues were ignored and baseline recall in both groups was similar].

The second main finding illustrated in Figure 10.3.2 lends strong support to the prediction that TI imagers would recall more highly typical items than either mediumly typical or atypical items. The prediction that PI imagers would exhibit a different typicality effect was also confirmed. Figure 10.3.2 clearly shows that PI imagers recalled fewer mediumly typical exemplars than highly typical or atypical exemplars. This pattern replicates that found in experiments 4 and 7 and further supports the hypothesis that the two different classes of memory are organized differently.

The third major finding, illustrated in Figure 10.3.3, was that cue type, independently of imagery instruction, promoted cross-over typicality effects: locational attribute cues enhanced recall to atypical, mediumly typical, and highly typical, exemplars [from highest to lowest in that order] whereas perceptual attribute cues enhanced recall to highly typical, mediumly typical, and atypical, exemplars [from highest to lowest in that order]. Regardless of imagery instruction, then, locational cues abolished the usual effect of typicality and perceptual cues enhanced the typicality effect. However this finding was more easily understood in the light of the finding of a three way interaction of imagery instructions by cue type by typicality.

The fourth and most central finding, illustrated in Figure 10.3.4, was that of a highly significant triple interaction of imagery instruction, cue type, and typicality. It is clear from Figure 10.3.4 that inappropriate cue type reduced recall and eliminated the typicality effects induced by imagery instructions and by L and P cues, e.g. PI-P, and TI-L. However there was a slightly steeper slope for PI-P [than TI-L], from highly typical to mediumly typical to atypical, suggesting that perceptual attributes acted to reinstate the typicality effect despite PI imagery instructions. This suggested that at retreival the memory search employing perceptual attribute cues commenced at a memory location subject to typicality effects, e.g. at the semantic category. Conversely there was only a 2% increase in recall from mediumly typical and atypical exemplars to highly typical exemplars in TI-L suggesting that the memory search in this instance commenced at a memory site not subject to strong typicality effects, e.g. semantic representation of locations.

In contrast, appropriate cues acted to increase recall and induced the predicted typicality effects. TI-P produced a very powerful typicality effect where over 37% more exemplars where recalled at highly typical than mediumly typical and atypical levels. Suggesting that semantic categories had mediated encoding. Conversely in PI-L more atypical exemplars were recalled than at highly, or mediumly, typical levels, indicating that semantic categories had not mediated encoding.

Although this latter finding supported the prediction of no semantic typicality effect in the PI group the finding that most exemplars were recalled to locational cues by PI imagers at the atypical level was somewhat suprising. One plausible explanation for this effect emerged from a reconsideration of attribute overlap observed in experiments 3 and 6: in experiment 3 it was found that descriptions of PI images of atypical exemplars exhibited only minimal locational attribute overlap with more typical exemplars and that increasing typicality was accompanied by increasing location attribute overlap. It may then have been the case that locational attributes used in this experiment to cue atypical exemplars were more distinctive than other locational cues. Hence the superior recall of these exemplars. Note that other researchers [Jacoby and Craik, 1979; Eysenck, 1979; Klein and Saltz, 1976; Norman and Bobrow, 1977; Wickelgreen, 1977] proposed that the distinctiveness of a memory trace may make that trace more retrievable, although distinctiveness per se was not considered the sole determinant of retrieval. Eysenck [1979] argued that distinctiveness may be thought of as an extension of the encoding specificity principle [Tulving and Thomas, 1973] which emphasises that recognition memory is determined by the extent to which " the test-trial encoding contains information that is unique to the study-trial encoding ", [p.111]. In the present case it is proposed that atypical locational cues were more specific to the PI imaging of atypical exemplars than medium and highly typical cues were to the PI imaging of medium and highly typical exemplars. Examination of the locative attribute norms [Appendix D] suggested that the locations named to atypical exemplars were usually more distinctive than locations named to exemplars at other typicality levels; occassionally however, highly distinctive locations were named to medium and highly typical exemplars. It was tentatively concluded that cues to PI images of atypical exemplars may, by virtue of their distinctiveness, have acted to raise recall of atypical exemplars in this condition.

This effect would have been specific to PI imaging because TI images would have contained little or no locative information. Yet it might be argued that perceptual cues to atypical exemplars were also distinctive and therefore should have raised recall of TI imaged atypical exemplars. However previous research argues against this. In reviewing her own research Rosch [1978; see chapter 4] has pointed out that one of the reasons some exemplars were judged atypical of a category was that those exemplars contained information that overlapped with exemplars from other classes. Hence perceptual attributes of atypical exemplars were not as distinctive as locational attributes of the same exemplars because they were common to a number of exemplars from different classes, [although past research has not established whether atypical locational attributes overlap across categories examination of locational norms in Appendix D indicated that locationsal attributes of atypical exemplars did not overlap with exemplars from other classes].

Obviously this is a speculative interpretation of the PI atypical locational cued finding and, in addition, is somewhat tangential to the findings bearing directly upon the content hypothesis. The main finding was that locational cues facilitated the recall of autobiographical memories of exemplars whereas perceptual cues facilitated the recall of semantic memories of exemplars. Thus the content hypothesis was supported. It was concluded that episodic encodings of previously imaged autobiographical memories contained information about locations and this locative information was either contained directly in specific autobiographical memories or in connected semantic representations of locations. Episodic encodings of imaged semantic memories predominantly contained perceptual information. A strong semantic typicality effect for perceptual cued TI imagers indicated that these Ss had accessed semantic categories at encoding. The failure to observe a similar semantic typicality effect in PI imager's recalls indicated that these Ss had not accessed a semantic category at encoding and, therefore, that autobiographical memories were not organized in semantic categories.

10.13 General Conclusions

The case for a content distinction between autobiographical and semantic memories has been strongly confirmed. Experiment 7 found that different classes of attributes were judged more or less quickly depending upon the class of memory that had been activated. Experiment 8 found that different classes of attributes facilitated recall of exemplars depending upon the type of memory activated at encoding. It was concluded that autobiographical memories predominatly contain information about the locations of objects whereas semantic memories do not. Semantic memories contain information about the perceptual properties typicaly associated with an object whereas autobiographical memories do not. It was further concluded that autobiographical memories may connect more directly to semantic representations of locations than to other semantic memories.

The hypothesis that autobiographical and semantic memories were differently organized was also confirmed. Experiment 7 replicated the finding of experiment 4: a] that unprimed images of semantic memories were generated more slowly than unprimed images of autobiographical memories, and; b] that images of semantic memories were generated more quickly to higly typical than mediumly typical and atypical exemplars whereas images of autobiographical memories were generated more quickly to highly typical and atypical exemplars than to mediumly typical exemplars. It was concluded that autobiographical memories were generally more accessible than semantic memories. It was also concluded that semantic memories were organized in semantic categories whereas as autobiographical memories were not organized in similar categories and were, at least in part, organized in terms of recency of encoding. Experiment 8 generally supported these conclusions.

CHAPTER 11

SEMANTIC STRUCTURES AND AUTOBIOGRAPHICAL MEMORIES

The three preceding chapters have been primarily concerned with investigating the content distinction between autobiographical and semantic memories of the same items. Also, but secondary to content, organizational differences have been observed between the two classes of memory. The conclusion reached at the close of the last chapter was that, although autobiographical and semantic memories differed in content and organization, one of the ways in which autobiographical memories connected to the semantic system was via semantic representations of information about locations. This chapter is concerned with semantic representations of locational and perceptual attributes and with connections between the two classes of attribute.

It was not intended to provide a definitive or complete account of the representation and interconnection of locational and perceptual attributes for, clearly, this would require extensive research: rather, the aim was to investigate these two classes of attribute in the light of the findings of experiments 3, 7, and 8, which had indicated that autobiographical memories connected to semantic memories of locations. As noted in experiments 4 and 6 it is not clear whether the semantic representation of locations was in the form of scripts or categories. Although this question is only indirectly investigated in this chapter it will be come clear that the findings strongly imply script-like semantic representation of locational information. It was also hoped that data bearing upon the interconnections of locational and perceptual attributes would shed some light on the pattern of primed image generation times observed in experiment 4 and the attribute verification times observed in experiment 7 and this is discussed further, below.

Three experiments featuring similarity judgments were conducted. The investigations were of sets of perceptual attributes [experiment 9], sets of locational attributes [experiment 10], and sets of both types of attributes [experiment 11]. The similarity judgments were analysed by use of a multi-dimensional scaling [MDS] algorithm [see Schiffman, Reynolds, and Young, 1981, for a non-mathematical introduction]. The rationale of this type of experimental paradigm is that similarity judgments reflect the underlying structure of memory [see for example Smith, Shoben, and Rips, 1974] and MDS maps structure contained in the similarity judgments.

The findings indicated that semantic representations of locations were clustered together in terms of the common activities which they enabled [Bower, Black, and Turner, 1979], whereas perceptual attributes were distributed amongst a number of dimensions and exhibited a clustering suggesting a perceptual 'core' or prototype. When both locational and preceptual attibutes where ranked with each other the resulting configurations were interpreted as depicting dimensional spaces which contained concentrations of attributes that compiled into; a] 'scenes' [script-like structures] clustered around common activites, b] descriptions of objects clustered around a [perceptual] prototype, and c] descriptions of objects in scenes. It was concluded that locational attributes were organized in script-like or scene-like semantic representations whereas perceptual attributes were organized around prototypical semantic representations. It was also concluded that script-like semantic representations connected to prototypical representations. These conclusions are discussed in detail at the close of the chapter.

Experiment 9

Similarity Judgments of Perceptual Attributes

11.1 Introduction

In experiments 4,7, and 8, perceptual and locational attributes contained in semantic and autobiographical memories were manipulated in order to explore differences between the two classes of memory. During the course of these experiments it became clear that the two classes of memory were connected. Experiment 3 found that the actual objects represented in autobiographical memories were idiosyncratic rather than typical and so the perceptual content of autobiographical memories tended not to be identical to the perceptual content of semantic memories [of the same item(s)]. However it was undoubtedly the case that objects encoded in autobiographical memories contained some perceptual information that would be classed as semantic indicating that perceptual semantic information may act as as link between the two memory classes. Yet the extent of this overlap was not discernable from the earlier experiments [see Experiment 3]. Rather the particular connection observed in experiments 7 and 8 was that of an autobiographical-semantic link via semantic representations of locations. Hence although it is likely that there are many qualitatively different connections between semantic and autobiographical memories it is the connection via locations that will be examined in this set of experiments.

In this first experiment Ss were asked to reference rank a set of perceptual attributes and exemplars drawn from a particular category according to how well they [reference and attribute or exemplar] 'went together'. The rankings were then subject to multidimensional scaling.

A few comments concerning the rationale and problems of multidimensional scaling are worth mentioning here. Firstly multidimensional scaling is '...simply a mathematical tool that enables us to represent similarities of objects spatially as in a map...' [Schiffman, Reynolds, and Young, 1981, p.3]. Secondly multidimensional scaling is most useful when the underlying dimensions and relations are not well known or well articulated. Thus multidimensional scaling might be thought of as a sophisticated tool employed in the process of systematic classification.

Nevertheless there are certain problems associated with multidimensional scaling and although these will not be gone into in any great detail here the reader should be aware that some aspects of scaling are questionable. Tversky [1977] has queried the appropriateness of meteric modelling of psychological judgments of similarity/dissimilarity arguing that such data may violate axioms of meteric space and that the resulting dimensions may, consequently, be artifactual products of the model rather than 'psychologically real' dimensions. However Krumhansl [1978] has replied to Tversky's criticisms arguing that violations of the axioms of meteric space may be less extensive and damaging than Tversky suggests. Krumhansal proposed a modified model based on distance-density considerations that obviated Tversky's criticisms.

The debate then about the appropriateness of meteric modelling remains open and it is by no means clear whether other forms of modelling are more or less appropriate [see Krumhansl]. Smith and Medin [1981] have argued that such modelling is useful and provides insights into the underlying organization of stimulus sets not otherwise available. The technique provides a convenient [and generally accepted] method of modelling complex similarity data and allows comparisons between data sets that would not be possible using other methods [e.g. cluster analysis, factor analysis, see Schifman, Reynolds, and Young].

One further point made by Smith and Medin of significane for the present research is that: although different theorists in the past have argued that <u>clusters</u> of attributes are fundamentally different from attributes arrayed on <u>dimensions</u> it now seems that this a spurious distinction for any set of nested attributes can be conceived of as being arrayed on a dimension or as being organized in discrete sets of associated attributes. The choice is in the eye of the modeller. Thus in the present experiment and in latter experiments in this chapter, dervived configurations will sometimes be discussed in terms of dimensions and sometimes in terms of clusters of attributes that 'sit' in the dimensional space. No strong theoretical distinction is drawn between clusters and dimensions.

The purpose of the present study was to examine the underlying structure of perceptual attributes. In this experiment exemplars of varying typicality were ranked along with some of their associated perceptual attributes. It was predicted that typical exemplars and attributes common to these exemplars would be clustered together in the scaling solution, indicating a perceptual prototype. Less typical exemplars and attributes would lie outside the prototypical clustering in less densely populated regions of the multidimensional space. It was also predicted that the configuration would fit in a space with a limited number of dimensions that would be easily interpretable. However the specificity of these dimensions could not be predicted in advance. It was unclear whether Ss would employ relatively specific and discrete dimensions such as size, shape, colour, and the like or more bipolar distinctions such as parts -vs- properties, functions -vs- attributes, etc. However, as the latter type of distinction emerged in experiment 3 in the classification of Ss descriptions of their images, it seemed probable that bipolar dimensions would be more frequently employed.

11.2 Method

It was decided that a small group of Ss would be required to reference rank three sets of exemplars and attributes drawn from three categories. As the reference ranking task may become very laborious for Ss it was decided to keep the ranking sets as small as possible and to allow S 'rest' periods every fifteen minutes. The reference ranking task operated as follows: one ranking consisted of an item being randomly selected from the stimulus set to act as the reference. All other items in the stimulus set were then ranked in order of decreasing similarity to the referent. The resultant rank order formed one row of the dissimilaritymatrix. This procedure was repeated for all items in the stimulus set. The data then was non-metric and similarity was 'row-conditional' [Coombes, 1964]. As more than one S took part it was also possible to examine individual differences in rankings. Note that the matrices were asymmetric. The data was scaled using the Alscal-4 [Young Takane, and Lewyckyj, 1978; Young and Lewyckyj, 1981] non-metric individual differences model.

Also note that Ss were asked to rank the stimuli according to how well they were judged to 'go together' or how closely they were 'related' rather than according to how similar they were.

Stimuli

From the group of nine categories used in experiment 1 the following three were randomly selected: Furniture, Clothing, Fruit. From each category pairs of exemplars from each of the three typicality levels, typical, mediumly typical, and atypical, were selected. These were the same as those previously employed in experiment 4. For each exemplar two perceptual attributes were selected from the perceptual attribute norms reported in experiment 4. The criteria for attribute selection were, A) that the attributes were from the four most frequently named attributes to the exemplar, B) that the attributes were, as far as possible, words and phrases with a single meaning, and C] that, where possible, the attributes were not themselves exemplars. Thus each stimulus set was comprised of 6 exemplars and 12 attributes. In addition to this the category superordinate was included in the stimulus set. Finally if the experimenter felt that the stimulus set did not fully represent attributes very frequently associated with the superordinate other attributes from the attribute norms for superordinates were also selected. [A pilot study had found that Ss objected if they felt that the stimulus set under-represented what they considered to be salient attributes of the category]. The eventual stimulus sets were: Furniture 22 items, Clothing 19 items, and Fruit 23 items. The actual stimuli are named in the scaling solutions reported below [Figures 11.1.1, 11.1.2, 11.1.3, and Tables 11.1.1, 11.1.2, 11.1.3]. A practice stimulus set drawn from the category Vegetable was similarly constructed.

Each S recieved one of 3! different orders of presentation of the categories. The order of selection of standards was also random [see below, Procedure]

Materials

All the stimuli were hand printed on 2 by 4 white cards. A score sheet was constructed in which to enter the rankings.

Subjects

6 Ss, three male and three female, all Open University employees [non-academic], took part. Average Age was 31 years, ranging from 28 to 35. All Ss were native English speakers.

Procedure

Ss took part, individually, in three separate one hour sessions over a ten day period. For all Ss there was at least one days' interval between sessions otherwise the interval between sessions was variable. Within sessions Ss carried out the experimental task for three periods of fifteen minutes seated in quiet room. There were short rest periods every fifteen minutes and each session commenced with S reading the following instructions:

"This experiment is designed to gather information about how closely we think certain things are related to each other. For example the colour 'green' would be judged as being very closely related to 'pea' whereas the colour 'black' would be judged as being only distantly related but more related than, say, the colour 'pink'. In this experiment you will be given sets of items that are more or less related and asked to judge how well certain items go together.

There are three sets of items in all and you are asked to work through each set separately. Each set is comprised of a common category of everday objects. For example Vegetables. The set contains the category name [Vegetable] plus some examples of the category [e.g. Potato, Pea, Carrot, etc.]. Also included in the set are some properties which other people have judged to be associated with the category and its members [e.g. hard, green, pointed, etc.]. Some of these items are very closely related to each other and some are only distantly, if at all, related to each other.

You are asked to make your judgments in the following way: pick any item to act as a reference or standard and put this item at the top of the table in front of you [all the items are printed separately on cards]. Then turn over all the other cards and pick out the item that you think is most related to the standard. Place this card immediately below the standard. Then select from the remaining items the item which you judge is next related to the standard and place this card immediately below the last card. Do this for all the items in the set. You will end up with a long list of items the top one of which is judged as being most closely related to the standard and the bottom one of which is seen as being least related to the standard. When you have done this turn over all the cards and you will see that each one has a number on the back. Write down on the score sheet that will be provided firstly the number of the standard card and then the numbers on all the other cards in the order in which you have arranged them [from most to least related]. Now put all the cards together and shuffle them [vigorously !]. Place the shuffled pack face down and turn over the top card, if this item has not already acted as a standard then use it as the standard for that go, if it has acted as a standard then turn over the next card and keep going until you reach an item that has not acted as a standard. Having selected another standard then turn over all the cards and arrange them from most to least related. Record the ordering as above. You can always check which items have or have not been used as standards by consulting your score sheet. Repeat this procedure until all the items in the set have acted as standards.

In each set there are about 20 items. You will be allowed three sessions of fifteen minutes in which to make your judgments. You are asked to rest in between sessions. You will find that three sessions of fifteen minutes provides more than enough time to judge all the items in a set.

The experimenter will demonstrate this procedure and you will be allowed a couple of practice runs during which any queries you have will be answered.

The experiment, then, is straightfoward simply judge each item according to how well it goes with or is related to the standard. There are no right or wrong answers just judge the items the way you see it."

Ss were then given a practice set and E guided them through the procedure. E also explained that S would have to attend on two subsequent days and arrangements were made for this.

Having understood the procedure Ss were allowed three fiftenn minute sessions with a minutes rest in between each session. All Ss completed their rankings within this time.

On each subsequent occassion exactly the same procedure was followed with the exception that the practice trial was omitted.

After each one hour session Ss were paid two pounds.

11.3 Results

Alscal produces a number of measures both of the goodness of fit of the model and of the weighting Ss give to different aspects of the model. Hence before reporting these findings a brief comment will be made on which aspects of the Alscal output are most germane to the present study.

Firstly the measure of fit recomended by Young [Young and Lewyckyj, 1980, Alscal-4 'User's Guide'] is that of squared correlation [RSQ]. RSQ is a measure of the proportion of variance acounted for by the model and, as such, is a simple and direct measure of how well the model fits the data. Other measures such as STRESS and SSTRESS have less straightfoward interpretations and in many cases are not as good indicators as RSQ [see Schiffman, Reynolds, and Young, 1981, p.175]. Thus only RSQ values will be reported in discussing the model. Secondly there are no commonly accepted analytical statistics used in evaluating the significance of RSQ values. It is generally true of multidimensional scaling algorithms that the central criterion of assessment is interpretability. Thus the most interpretable solution with the highest RSQ will be reported here. Generally RSQ values of .65 or more will be accepted. Given that the stimuli used were a [small] representative sample of a much larger set a model which accounts for 65%, or more, of the variance in the data would seem to provide an acceptable fit. Thirdly because the correspondence of the model to the data automatically increases with each dimension added, caution will be exercised in introducing additional dimensions. Particularly if these increase RSQ only by small amounts. For example adding a dimension in the present stimulus sets will generally increase RSQ by 5% hence higher dimensional solutions will have to increase RSQ by 10%, or more, to meaningfully extend the model. In other words the models selected below will err on the side of low dimensionality. Fourthly the discussion below will primarily focus on the overall model rather than individual differences between Ss. This is because it is expected that different Ss will emphasise different dimensions in their rankings but not to any extreme extent. However extreme or exclusive use of dimensions by Ss will be discussed if this occurs.

The results then divide into two sections; firstly relating to nature of the selected solution and secondly relating to Ss weighting of the dimensions in the model.

1] The Model

Three dimensional solutions were selected for all three stimulus sets, Furniture, Clothing, and Fruit. These are reported individually.

Furniture

Figure 11.1.1 depicts the three dimensional solution. RSQ was 0.71 indicating that the three dimensional solution accounted for over 70% of the variance in the data. Higher dimensional solutions added little in the way of dimensions that were more interpretable and only slightly raised RSQ: for the four dimensional solution RSQ was 0.76 and for the five dimensional solution RSQ was 0.79. Dimension 1, in Figure 11.1.1, depicts a dimension of 'furnitureness' [typicality] where small, glass, plastic and metalic, [less typical] objects lie on one pole of the dimension and wooden, angular, large, [more typical] objects lie on the opposing pole. Dimension 2 depicts a dimension of comfort-vs-appearance where hard and shiny objects oppose soft and comfotable ones. Dimension 3 depicts an attribute dimension on which attributes are polarised between functional attributes and perceptual attributes.

Clothing

Figure 11.1.2 depicts the three dimensional solution. RSQ was 0.72 indicating that the three dimensional solution accounted for over 70% of the variance in the data. Once again higher dimensional solutions added little to the model and RSQs for 4 and 5 dimensional solutions respectively were 0.78 and 0.82. Dimension 1, in Figure 11.1.2, is a perceptual attribute dimension polarized between perceptual properties [e.g. material, soft, woollen, etc.] and perceptual parts [e.g. pockets, sleeves, buttons, etc.]. Dimension 2 is polarized between attributes associated with wearing clothes [soft, warm, comfortable] and attributes associated with looking at clothes [colourful, fashionable] and with examples of clothing. However dimension 2 was not easily interpretable primarily because of the outliers 'legs, nylons' and 'hairband, purse'. Had more attributes and exemplars been employed possibly this dimension would have emerged more clearly. Dimension 3 juxtaposes functional aspects of clothing with fashionable aspects.

Fruit

Figure 11.1.3 shows the three dimensional solution. RSQ was 0.67 indicating that the three dimensional solution accounted for over 65% of the variance in the data. Higher dimensional solutions added little to the models interpretability. RSQs for 4 and 5 dimensional solutions were 0.73 and 0.77 respectively. Dimension 1, in Figure 11.1.3, is a dimension of 'fruitness' [typicality]. Dimension 2 is an attribute dimension ranging from perceptual parts to perceptual properties. Dimension is a dimension of 'edibleness' ranging from attributes closely associated with eating fruit to attributes and parts relating to inedible aspects of fruit.

For all three categories solutions of less than three dimensions produced very mediocre RSQ values of 0.53 and less.

Overall it is clear that similar dimensions and configurations of dimensions underlie the three sets of similarity rankings and these are tabulated in Table 11.1.1, over, [this table is discussed in more detail below].

NP

2] Individual Differences/ Alscal provides two measures of the weighting Ss give to the dimensions. The first measure is called the 'subject weights' and this gives the calculated weight for each subject on each dimension [in RSQs]. Ss varied little in the weighting they gave to different dimensions and, consequently, the averages of the subject weights were calculated and these are reported in Table 11.1.2, below.

Fig 11 1.1
3 Dimensional Solution for Reference Rankings of Perceptual Stimuli for the category Furniture

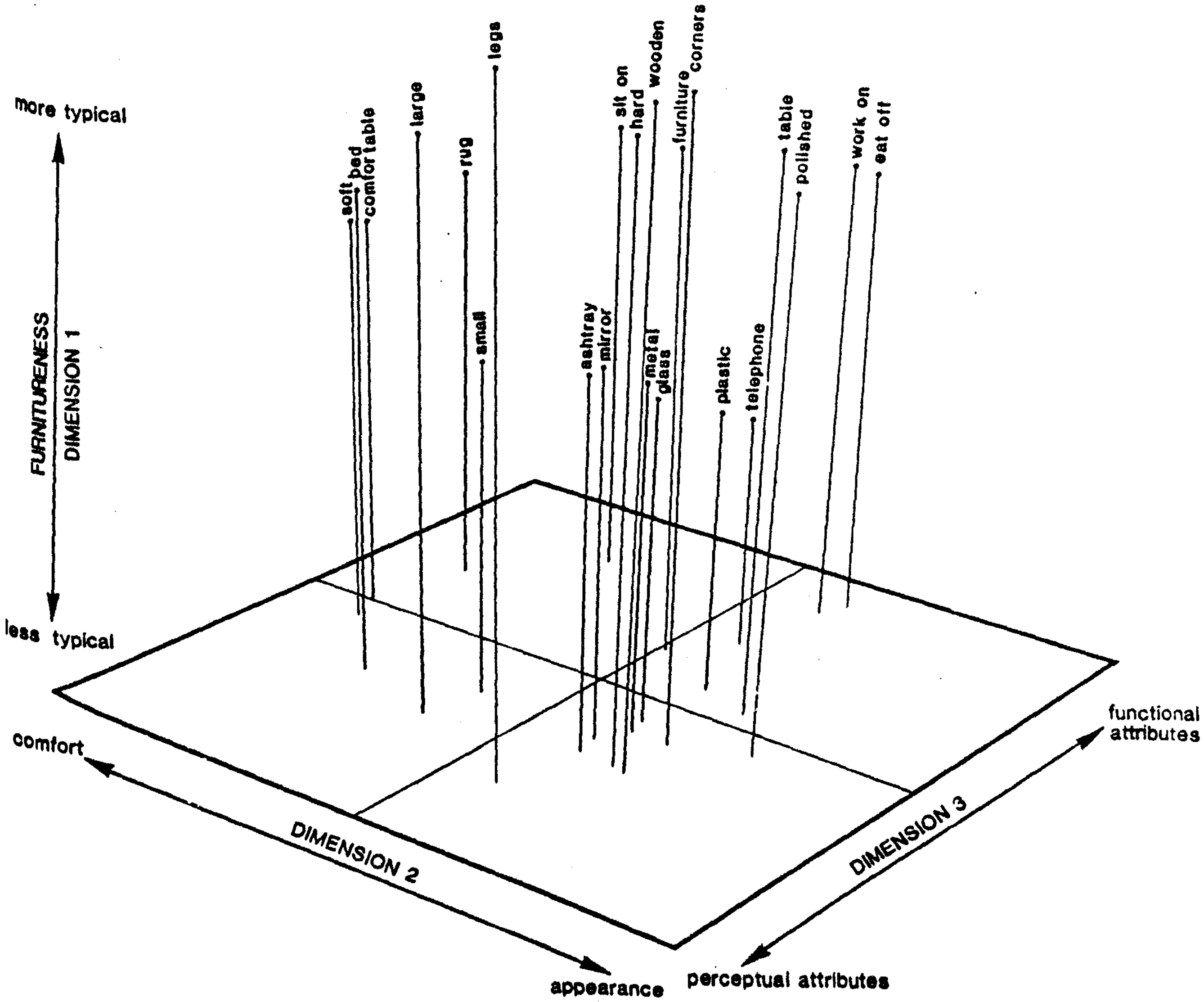


Fig11 1.2

3 Dimensional Solution for Reference Rankings of Perceptual Stimuli for the category Clothing

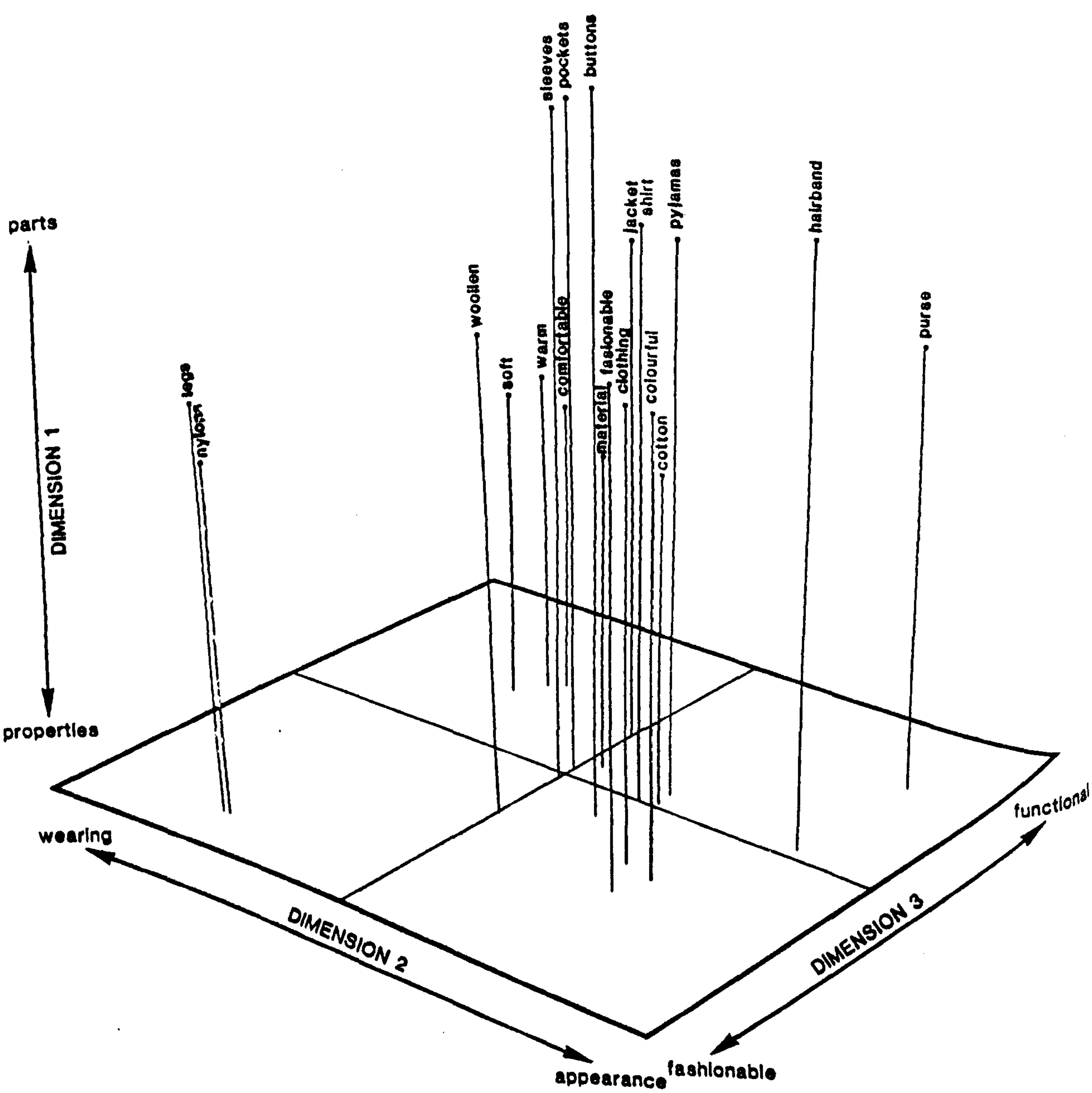


Fig 11 1.3
3 Dimensional Solution for Reference Rankings of Perceptual Stimuli for the category Fruit

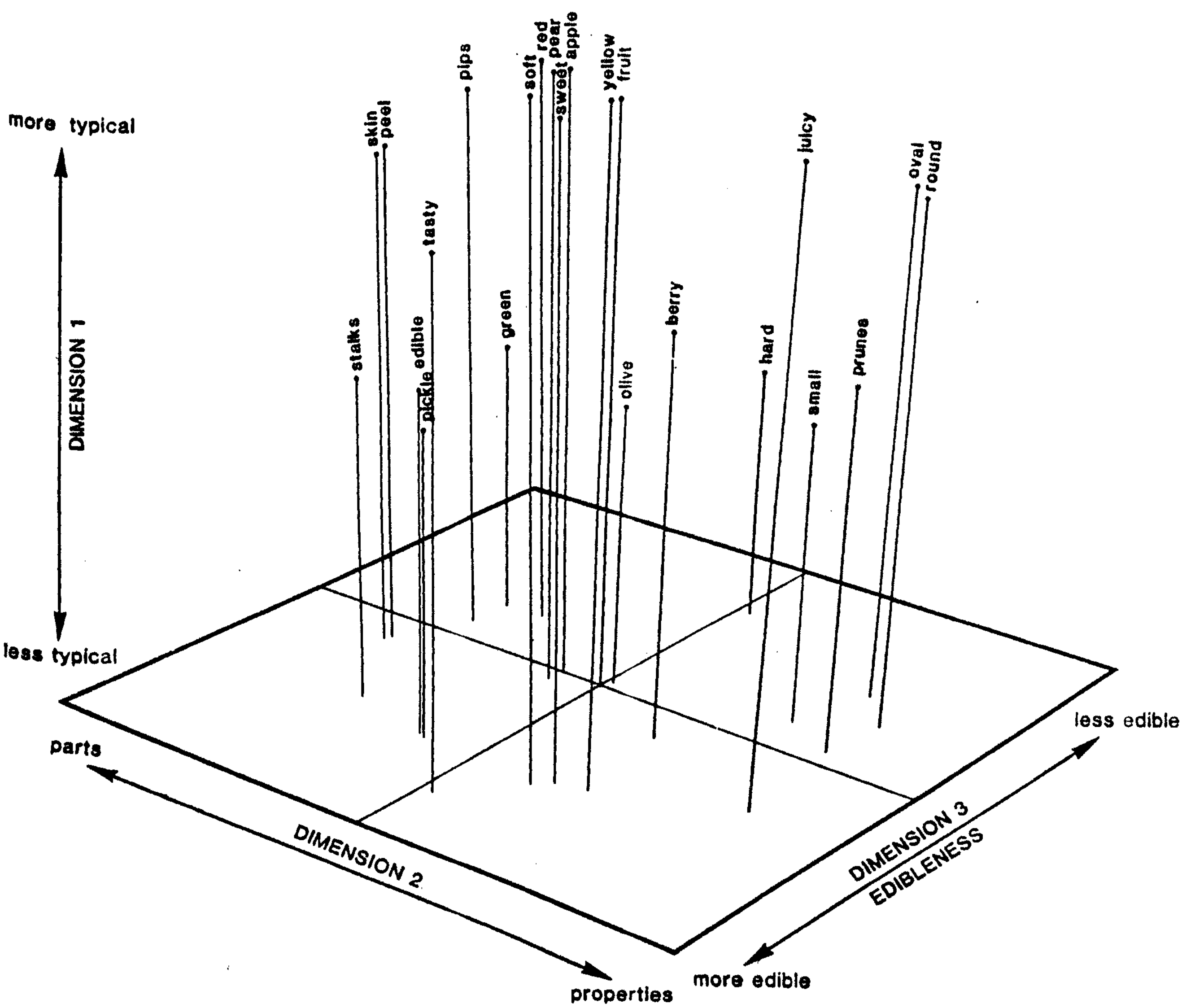


Table 11.1.1 The Three Dimensions Found for the Categories Furniture, Clothing, and Fruit: Perceptual Attributes [D=Dimension].

	Furniture	Clothing	Fruit
D1	'Furnitureness' [Typicality]	Attributes [parts-vs-properties]	'Fruitness' [Typicality]
D2	Comfort-vs -appearance	Wearing-vs -Appearance	Attributes [parts-vs-properties]
D3	Attributes [Functional-vs -Perceptual]	Functional-vs -Fashionable	Edibleness

Table 11.1.2 Averaged Subject Weights: Perceptual Attributes

Category	Dimension 1	Dimension 2	Dimension 3
Furniture	0.5003	0.4840	0.4052
Clothing	0.5092	0.4820	0.4517
Fruit	0.4814	0.4204	0.4048

It can be seen from Table 11.1.2 that although Ss, overall, weighted some dimensions above others, these differences are not of any great magnitude.

The second measure of Ss dimensional preferances is called the 'relative subject weight indices' and is a measure of how Ss differ from a typical S in the relative importance they attach to a dimension. These indices vary between + 1 and - 1, extreme values in either direction indicating an S's heavy weighting of that dimension. Although there were some differences on this measure, generally Ss weightings, for all three categories, varied between +0.5 and -0.5. No extreme weightings were observed.

Both these measures of individual differences indicated that although Ss exhibited dimensional preferences these were not extreme and Ss did not employ particular dimensions to the exclusion of others.

11.4 Discussion

The main finding was that the reference rankings were describable in terms of 3 dimensional models for all three categories, Furniture, Clothing, and Fruit. Also Ss clearly perfered to use bipolar types of dimensions rather than continuous dimensions such as size, shape, colour, etc., but note that these latter dimensions can be [faintly] detected within within the bipolar dimensions.

A dimension common to all the categories was that of 'attributes'. Ss made a distinction between perceptual parts of objects and perceptual properties. For example, in the category Clothing, buttons, sleeves, legs, were distinguished from properties such as colourful, warm, and soft. This finding supports the classification system employed in Experiment 3 [chapter 8] where a similar distinction was drawn between perceptual parts and properties. A dimension shared by the categories Furniture and Fruit was that of typicality. In Table 11.1.1 this is refered to as 'furniturenes' and 'fruitness'. The purpose of using these headings was to indicate that the dimension was not one of simple typicality [as in 'goodness-of-exemplar' measures, although certainly this was a component] but rather encompassed relations between exemplars, attributes, and superordinate suggesting a perceptual core [prototype] to the dimension. Although such a dimension does not emerge in the category Clothing it can be seen from Figure 11.1.2 that the stimuli cluster in a similar prototypical fashion. The remaining dimensions clearly ressemble each other [from category to category] although they are somewhat specific to their respective categories [e.g Usefullness and Edibleness]. Generally the dimensions divided into those depicting divisions of perceptual attributes, functional aspects of the stimulus set, and typicality. Embedded within these dimensions other divisions such as size, shape, hard-soft, etc., may be discerned [see Figures 11.1.1, 11.1.2, 11.1.3].

This low dimensionality suggests that perceptual attributes, and the objects and categories they refer too, are fairly sharply classified in memory and these classes combine to form memory structures such as prototypes. Of course a major problem for this sort of interpretation is that it maybe the reference ranking task that forces the S to employ discrete dimensions and thus the derived solutions reflect task strategies more than memory structures. However one argument against this is that Ss used similar dimensions in similar ways [see section 2 of Results above]. If the dimensions were chiefly products of problem solving strategies more variation might have been expected. As much of the work reviewed in Part 1 of this thesis has established that Ss employ protypical representations and make distinctions between classes of attributes, it seems reasonable to conclude that the dimensions observed in this experiment reflect underlying memory structures more than task strategies. Also the observed dimensions are similar to the classification system employed in experiment 3 [particularly the part-property dimension] further implicating the role of such dimensions in memory.

These findings, although of intrinsic interest, take on a more pertinent meaning when compared with dimensional solutions derived from reference ranking locational attributes. The next section, then, reports such a study.

Experiment 10

Similarity Judgments of Locational Attributes

11.5 Introduction

In experiment 3 [chapter 8] it was found that Ss descriptions of personal instance images were dominated by information about the locations in which objects had been experienced. Experiments 7 and 8 found that normative information about locations aided recall of personal instance imaged objects and that locations were verified more quickly than perceptual information when Ss generated personal instance images. Thus information about locations appears to play an important role in autobiographical memories. Further it seems likely that locative information has some form of semantic representation. Experiment 6 [chapter 10] found that locations were listed in a normative fashion similar to perceptual attributes and, as Ashcraft [1978] has observed, such norms are taken as reflecting semantic structure. In addition Tversky and Hemenway [1983] have reported that locations have a 'basic level' [Rosch, 1978] and are structured hierarchically, lending further support to the proposed semantic representation of locations. At the close of the last chapter it was argued that information about locations may comprise the dominant semantic content of autobiographical memories and, hence, provide integration between semantic and autobiographical memories.

The question then arises as to whether or not semantic representations of locations are similar in structure to other semantic representations, as Tversky and Hemenway suggested. The present experiment examines the proposal that the semantic representation of information about locations is similar in structure to that of perceptual information.

However it was not clear that reference rankings of locations would produce simple, low dimensional, readily interpretable solutions similar to those reported in experiment 9 [above]. It is in fact difficult to envisage what sort of dimensions would underlie locations. Tversky and Hemenway [1983] report only one major [superordinate] dimension 'inside -vs- outside'. Whereas, following Bower, Black, and Turner, [1979] who argued that scripts were grouped around the primitive actions they enabled, it might be predicted that locations are similarly grouped around certain actions. Thus locations may be highly dimensionalized in terms of groups of actions. [Note that in the introduction to experiment 9 it was argued that the concept of nested groups or clusters of attributes is not imcompatible with the concept of a dimension: clusters may imply underlying dimensions, dimensions may imply clusters of attributes]. Examination of the descriptions of personal instance images collected in Experiment 3 suggested that although these images did not themselves contain information about actions, the locations of the imaged objects were locations in which certain actions were characteristically performed. For example a personal instance image of the table in one's kitchen implies the act of eating. It seemed probable then that locations would be structured in terms of the activities for which they are the setting.

This experiment is procedurally identical to that of experiment 9. Ss referenced ranked sets of items naming locations, objects, and superordinate. It was predicted that locations would group together in terms of common actions. The level of specificity of the dimensions is not predicted although it is expected that these will be more specific than simply 'inside -vs- outside'. Finally it was not expected that the dimensions would be namable by single words but rather that they would be bipolar [similar in compostion to the dimensions observed in experiment 9] opposing certain activities and groups of activities against one and other.

11.6 Method

The method was identical to that employed in experiment 9, above.

Stimuli

The stimuli were identical to those employed in experiment 9 with the exception that perceptual attributes were replaced by locative attributes. Note that occasionally more or less attributes were replaced. The number of items in the three stimulus sets were: Furniture 21, Clothing 20, Fruit 23. The actual stimuli are named in the scaling solutions reported below, Figures, 11.2.1 [Furniture], 11.2.2 [Clothing], 11.2.3 [Fruit].

Materials

These were identical to those used in experiment 9.

Subjects

6 Ss took part, three male and three female all Open University employees [non-academic]. Average age was 36 years ranging from 26 to 39. All Ss were native English speakers.

Procedure

This was identical to experiment 9, with the following exception: in the instructions mention of perceptual attributes was substituted by mention of locations and the perceptual attributes associated with the test category Vegetable were substituted by locations.

11.7 Results

The data was analysed using Alscal-4 and the same criteria in interpreting the output was employed. 3 dimensional solutions were selected for all three stimulus sets.

1] The Model

Furniture

Figure 11.2.1 depicts the three dimensional solution. RSQ was 0.76 indicating that the model accounted for 76% of the variance in the data. RSQ for 4 and 5 dimensional solutions were, respectively, 0.79 and 0.82, indicating that higher dimensional solutions added little to the models' explanatory power. Dimension 1 polarises private -vs- public locations for furniture. Dimension 2 polarises work -vs- pleasure locations. Dimension 3 polarises domestic -vs- commercial locations. It is clear that dimensions are not fully distinct, for instance the 'pleasure' pole of dimension 2 overlaps with the 'domestic' pole of dimension 3. This is discussed further below. Note also that these three dimensions effectively combined to split the configuration into two large clusters. However a two dimensional solution yielded an RSQ of only 0.617 which was less than the criteria of 0.65.

Clothing

Figure 11.2.2 depicts the three dimensional solution. RSQ was 0.76 indicating that the model accounted for 76% o the variance. 4 and 5 dimensional solutions gave RSQs of 0.80 and 0.83 respectively. Dimension 1 depicts cleaning -vs- storing locations. Dimension 2 depicts shopping and wearing -vs- storing. Dimension 3, which is not very distinct, depicts location of clothing in transit 'travelling' -vs- locations of clothing in storage. These dimensions clearly overlap with one and other and essentially consist of storage locations, and

Fig11 2.1
3 Dimensional Solution for Reference Rankings of Locational Stimuli for the category Furniture

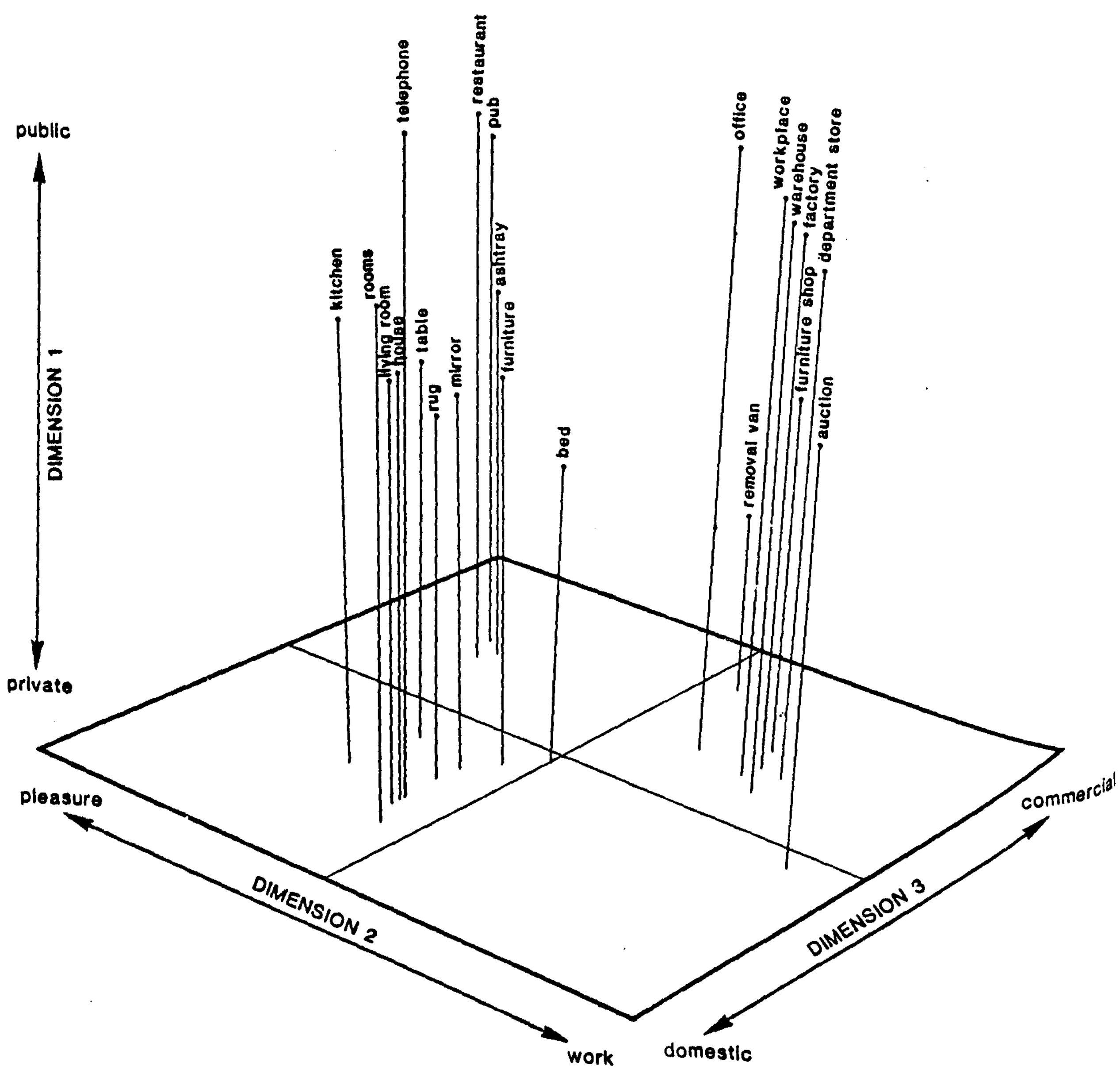


Fig11 2.2
3 Dimensional Solution for Reference Rankings of Locational Stimuli for the category Clothing

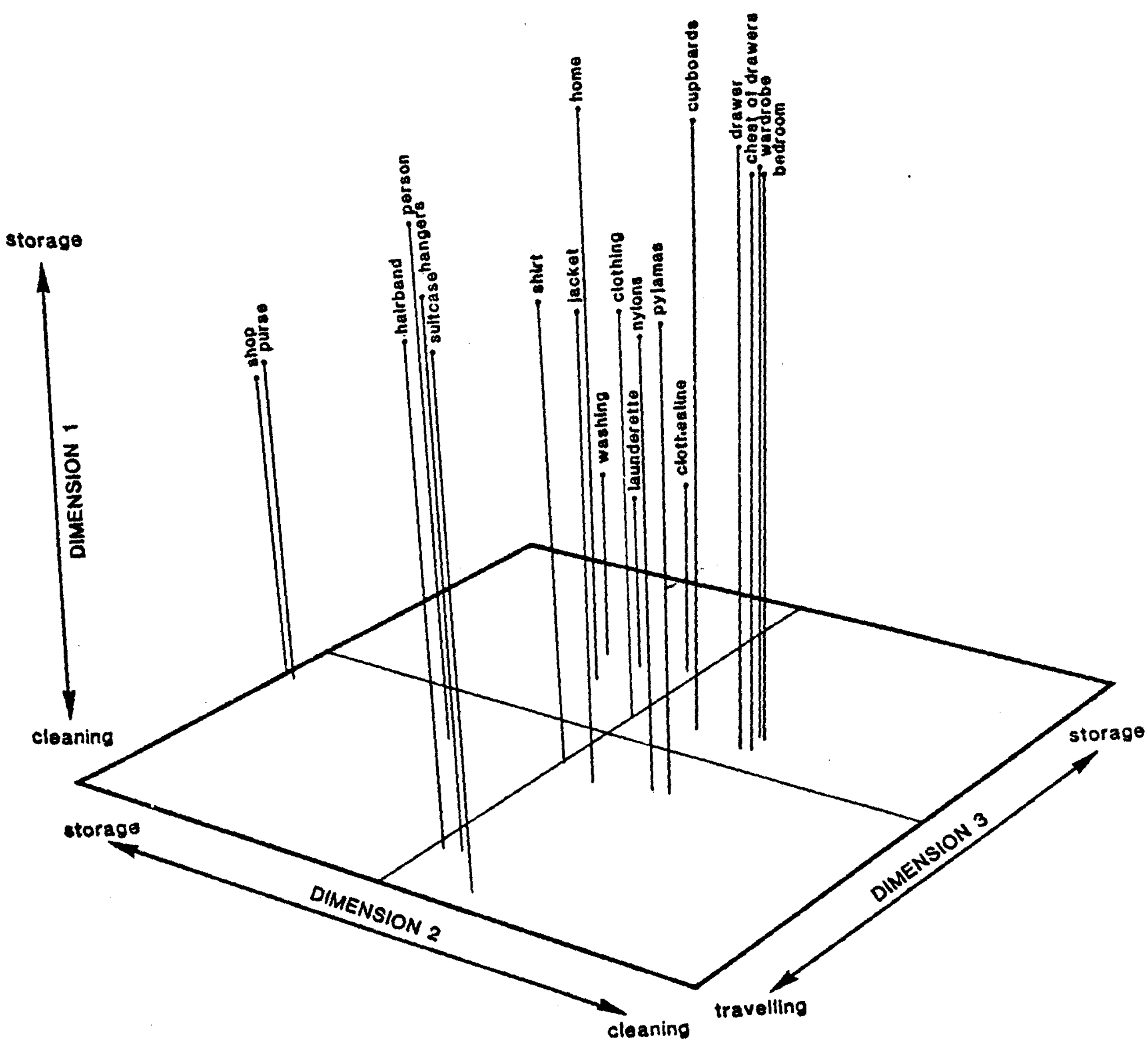


Fig11 2.3
3 Dimensional Solution for Reference Rankings of Locative Stimuli for the category Fruit

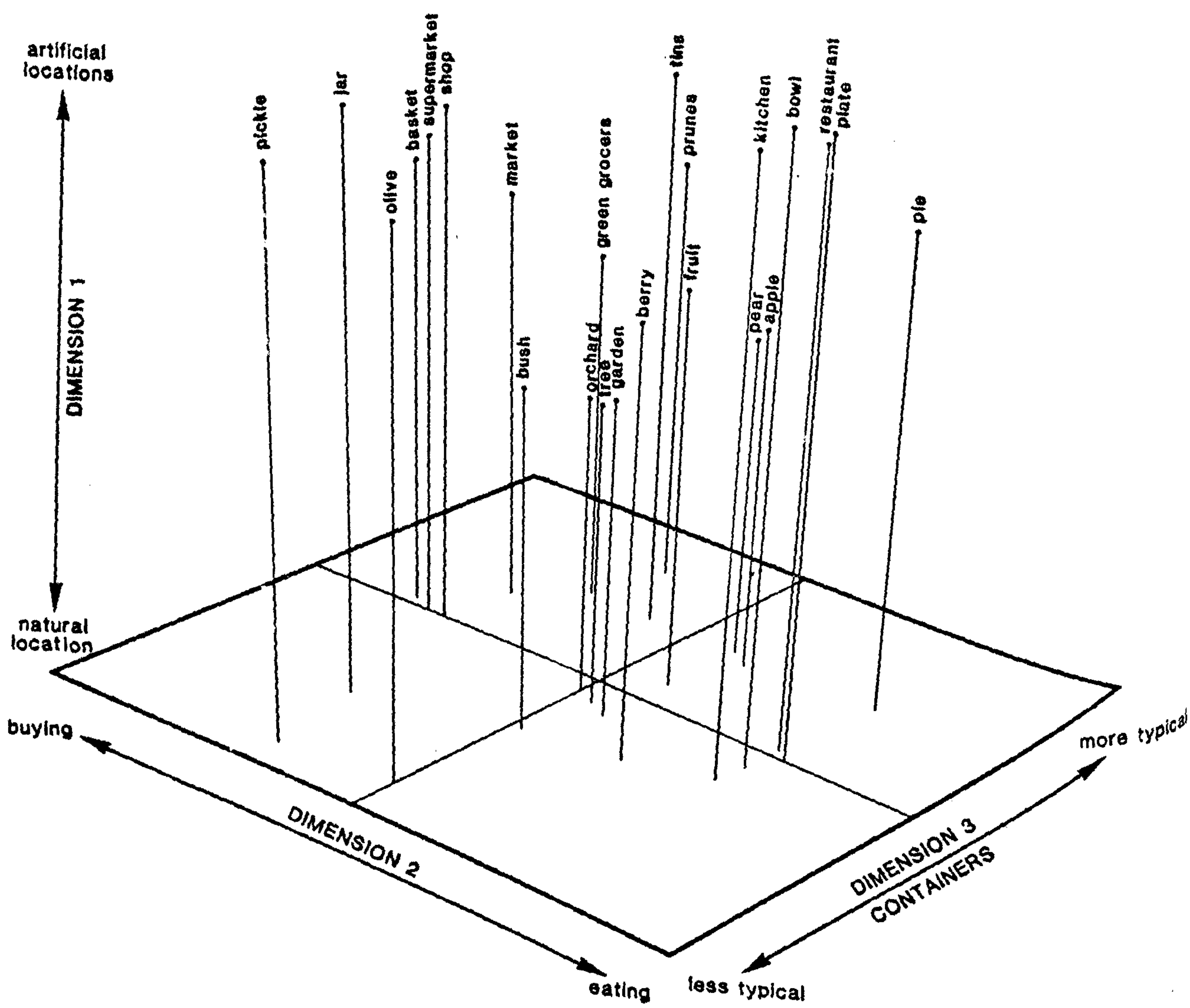


Table 11.2.1 The Three Dimensions Found for the Categories Furniture, Clothing, and Fruit: Locational Attributes [D=Dimension]

Furniture	Clothing	Fruit
D1 Private/Public	Cleaning/Storage	Natural/Artificial
D2 Work/Pleasure	Shopping+Wearing/ Storing	Eating/Buying
D3 Domestic/Commercial	Storage [Static/ Travelling]	Containers

Table 11.2.2 Averaged Subject Weights: Locational Attributes

Category	Dimension 1	Dimension 2	Dimension 3
Furniture	0.5053	0.5029	0.4954
Clothing	0.5864	0.4609	0.4525
Fruit	0.5525	0.4663	0.4135

aspects thereof, versus all other locations. This is discussed further below.

Fruit

Figure 11.2.3 depicts the three dimensional solution. RSQ was 0.74 indicating that the model accounted for 74% of the variance. RSQ values for 4 and 5 dimensional solutions were 0.78 and 0.82 respectively. Dimension 1 juxtaposes natural -vs- artificial locations of fruit. Dimension 2 depicts eating -vs- buying locations for fruit. Dimension 3, not very distinctly, juxtaposes types of containers and associated fruits, e.g. tins, pies,[more typical]-vs-jar, bush, [less typical]. Once again it is clear that these dimensions overlap although not as extensively as those for Furniture and Clothing.

For all three categories two dimensional solutions produced RSQs of 0.55 or less [with the exception of Furniture, see above].

Overall it is clear that the dimensions for all three categories were not completely distinct and that considerable overlap was also present. It is also evident the each of the solutions contain discrete clusters of items and this is more marked in comparison to the solutions for perceptual attributes. Table 11.2.1, below, tabulates the dimensions found for each category.

2] Individual Differences

Ss varied little in the weighting they gave to different dimensions. Table 11.2.2, below, presents the averaged subject weightings, [averaged across subjects].

It can be seen from Table 11.2.2 that Ss overall weighted some dimensions more than others and this was particularly so for the categories Clothing and Fruit. Generally it appears that less distinct dimensions were of less importance in Ss ratings. Thus dimension 3 for Clothing and Fruit, although clearly used, was of less importance than dimension 1 and this was the case for all Ss. This is discussed further below.

Finally the relative Subject weight indices were examined. As these varied between + 0.49 and - 0.35 it was concluded Ss use of the dimensions relative to a hypothetical 'typical' S were reasonably similar.

Both these measures of individual differences indicated that Ss agreed upon the saliency of different dimensions and that some dimensions appeared to be more salient than others.

11.8 Discussion

The main finding was that all three sets of stimuli, Furniture, Clothing, and Fruit, were best modelled by three dimensional solutions. However these solutions were structually differently from those observed in experiment 9. Most notably it was evident that the poles of the dimensions overlapped with each other.

In the Furniture set all three dimensions overlapped to some degree. Thus the private/public, work/pleasure and domestic/commercial dimensions contained similar clusters of stimuli but emphasised different aspects of those clusters. For instance the 'public' pole of dimension 1 contained the items 'department store, factory, warehouse, and office' which were also contained [although more predominatly] in the 'work' pole of dimension 2 and [less dominantly] in the 'commerce' pole of dimension 3. The reader can see from Figure 11.2.1 that other clusters are more or less emphasised on differing dimensions. Similarly for the Clothing stimulus set various aspects of a cluster of items representing the storage of Clothes are emphasised differentially to yield the three dimensions. This overlap is also evident in the Fruit stimulus set where dimension 1, natural/artificial, overlaps with dimension 2, eating/buying, which in turn overlaps with [the not very distinct] dimension 3, containers. This overlap, then, suggests that locations are clustered around certain distinct and characteristic activities associated with the stimulus set. Thus Furniture can be 'worked on', 'lounged on', 'sold and bought'. Clothing can be 'cleaned', 'stored', 'bought', and 'worn'. Fruit can be 'picked', 'bought', 'eaten', and 'stored' [dimension 3]. Locations in which these activities are performed clustered together to yield the dimensions described above.

However similar activities can be undertaken in identical locations: for example at a restaurant food is both purchased and eaten, at home a table might be eaten off or worked on, and clothes are worn in locations where they can be bought and/or stored. Hence it would seem reasonable to suggest that locations take on more detailed meaning according to the actions which are undertaken in them. Yet generally locations were clustered together according to the similarity of acivities with which they were typically associated or, in Bower et al's terminology, according to 'the actions which they enabled'. These sorts of representations, then, would seem to be best described by the concept of a 'script' [see chapter 3 and 4, Schank, 1975; Schank and Ableson, 1978; Bower, Black and Turner, 1979]. Note that this only partly questions the two central proposals of Tversky and Hemenway [1983] which were that there was a basic-level of representation of locations and that locations were represented in hierarchies like semantic categories. The present findings are relatively neutral as regards the proposal of a basic-level although this may be because all the locational stimuli were at a basic level. Examination of the locational norms gathered in experiment 6 [appendix d] indicated that the more frequently named locations were at a similar level of specificity. However the proposal suggests that the superordinate organizing structure for locations is script-like rather than a summary descritpion of a class [see the general model of categorization outlined in chapter 4]. There may then be a basic level of locational representation but locations are not organized in way similar to that of semantic categories. Thus autobiographical memories, in as much as they predominantly contain information about locations [and context generally], connect to the semantic system via such scripts or scene-like semantic memory representations.

It was also clear that Figures 11.2.1, 11.2.2, and 11.2.3, contained clusters of items organized categorically. In other words actual exemplars and their superordinate were clustered together, although these did not contribute towards the dimensionality of the solutions. This suggests that the script representation 'points' [Bower et al] towards the semantic category. Thus autobiographical memories may connect to semantic categories via script-like clusters of locations that connect to semantic representations of objects typically found in those locations. Such an account suggests why the perceptual attributes took longer to verify than locations when Ss generated personal instance images [experiement 7]: activation had to spread further from its souce in autobiographical memory to activate information about perceptual attributes than information about locations. The reverse explanation would account for the perceptual attribute verification time advantaged observed when Ss generated typical instance images.

It was also found that, at least for Clothing and Fruit, certain dimensions were generally [across subjects] weighted more heavily than others. This shows, unsuprisingly, that certain locations [and hence actions] are more characteristic of sets of stimuli than other, equally plausible, locations.

Finally certain differences are apparent between the solutions found in this experiment and those observed in experiment 9. Firstly locations tend to occur in discrete tight clusters whereas perceptual attributes tend to be more evenly distributed in the dimensional space. This suggests that perceptual attributes may be inherently more dimensionalizable than locations. Secondly although that objects in the locational solutions showed some evidence of clustering suggestive of a semantic category this was not nearly as marked as the clustering of perceptual attributes and objects. Perceptual attributes were markedly organized in terms of the centrality of objects and attributes to the set [prototypicality]. Locations were organized around activities associated with them. Because many different activites may be undertaken at the same location there was considerable overlap between the observed dimensions. In the locational stimulus set different dimensions emphasised different aspects of similar clusters of locations whereas in the perceptual stimulus set different dimensions were comprised of different clusters.

The question then arises as to what relationship exists between perceptual attribute organization and locational organization. In the following, and final, experiment perceptual attributes and locations were jointly investigated and Ss made similarity judgments of sets containing both classes of attribute.

Experiment 11

Similarity Judgments Of Perceptual and Locational Attributes

11.9 Introduction

In the preceding experiments, 9 and 10, 3 dimensional models of the reference rankings of sets of stimuli containing either perceptual attributes or locations were observed. In this experiment Ss were required to reference rank sets of stimuli containing both perceptual and locational attributes. However it was not expected to observe an additive effect of dimensionality, i.e. six dimensional solutions. It seemed more likely that models of these rankings would contain higher order, more abstract, dimensions. In particular it was predicted that perceptual attributes would cluster prototypically whereas locations would cluster in terms of commom actions. The configurations of interest would be the dimensional relations of these clusters. In other words dimensions that included both perceptual attributes and locations would be of primary interest.

It was predicted that one of the ways Ss would rank the stimuli would be by reference to scripts or scenes and the objects that such scripts contain. However it was also predicted that Ss would draw a sharp distinction, whenever possible, between perceptual attributes and locations. Thus it was expected that at least three major dimensions would emerge in the models: 1] dimensions of scenes containing descriptions of objects; 2] a categorical distinction between classes of attributes [perceptual attributes-vs-locations] and; 3] dimensions of typicality.

11.10 Method

The method was identical to that employed in experiment 9.

Stimuli

The stimuli were identical to those employed in experiments 9 and 10, with the following alterations: as a pilot test had indicated that ranking three stimulus sets each containing 30 plus items required Ss to attend the laboratory more times than they were prepared to, one stimulus set was randomly eliminated [Fruit]. The remaining two stimulus sets, Furniture and Clothing, were comprised of the stimuli from experiments 9 and 10, i.e. perceptual attributes and locations. Furniture contained 36 items and Clothing contained 32 items. The actual stimuli are displayed in Figures 11.3.1 and 11.3.2, below.

Subjects

5 Ss took part, three females and two males. Average age was 33 ranging from 29 to 37. All were english speaking Open University employees [non-academic].

Materials

Were the same as those used in experiments 9 and 10.

Procedure

The procedure was identical to that employed in experiments 9 and 10 with the following alterations: 1] Ss attended the laboratory for four one hour sessions; 2] The examples in the instructions were approriately altered to include both perceptual attributes and locations: 3] The practice stimulus set [Vegetable] included both perceptual attributes and locations.

11.11 Results

The data was analysed using Alscal-4 and the output was judged by the same criteria as that employed in experiments 9 and 10.

1] The Model: three dimensional solutions were accepted for both stimulus sets. Higher dimensional solutions did not greatly increase RSQ values. But note that higher dimensional solutions did include nameble dimensions similar to those observed in experiemnts 9 and 10. In the higher dimensional solutions the data was partioned into perceptual attributes and locations and additional dimensions were drawn from these domains. Therefore as these additional dimensions were substantively the same as the dimensions oberserved in experiemnts 9 and 10 and as they did not greatly elevate RSQ values, they are not further reported here. The three dimensional solutions contained dimensions not observed in experiments 9 and 10 and these dimensions accounted for most of the variance in the data.

Furniture

Figure 11.3.1 depicts the 3 dimensional solution for Furniture. RSQ was 0.71 indicating that the 3 dimensional solution accounted for 71% of the variance. RSQ values for 4 and 5 dimensional solutions were 0.75 and 0.79 respectively. Dimension 1 juxtaposes furniture locxations [primarily commercial] with perceptual attributes. Dimension 2 depicts a dimension of scenes ranging from domestic and private to public and pleasurable. Dimension 3 juxtaposes functional aspects of furniture with perceptual attributes [primarily perceptual properties, e.g. large, small, hard, etc.].

Note the clustering of perceptual attributes and objects with locations, e.g. 'Ashrtay, Pub, Glass, Resraurant'. Note also that the superordinate 'Furniture' clusters most closely with 'Kitchen, Living room, and House' rather than with groups of perceptual attributes. These findings are discussed further

Fig11 3.1
3 Dimensional Solution for Reference Rankings of Perceptual and Locative Stimuli for the category Furniture

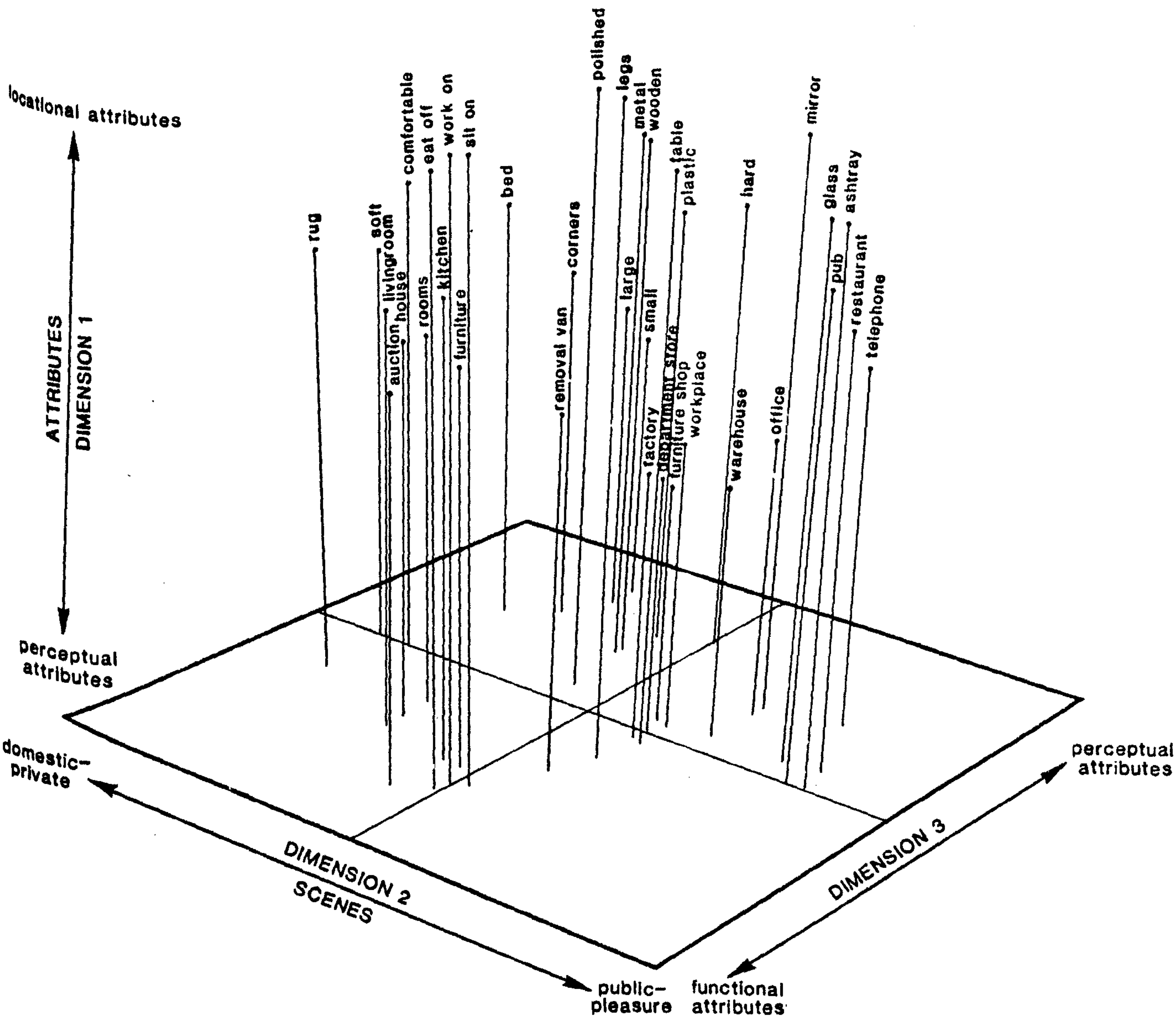


Fig11 3.2
3 Dimensional Solution for Reference Rankings of Perceptual and Locative Stimuli for the category Clothing

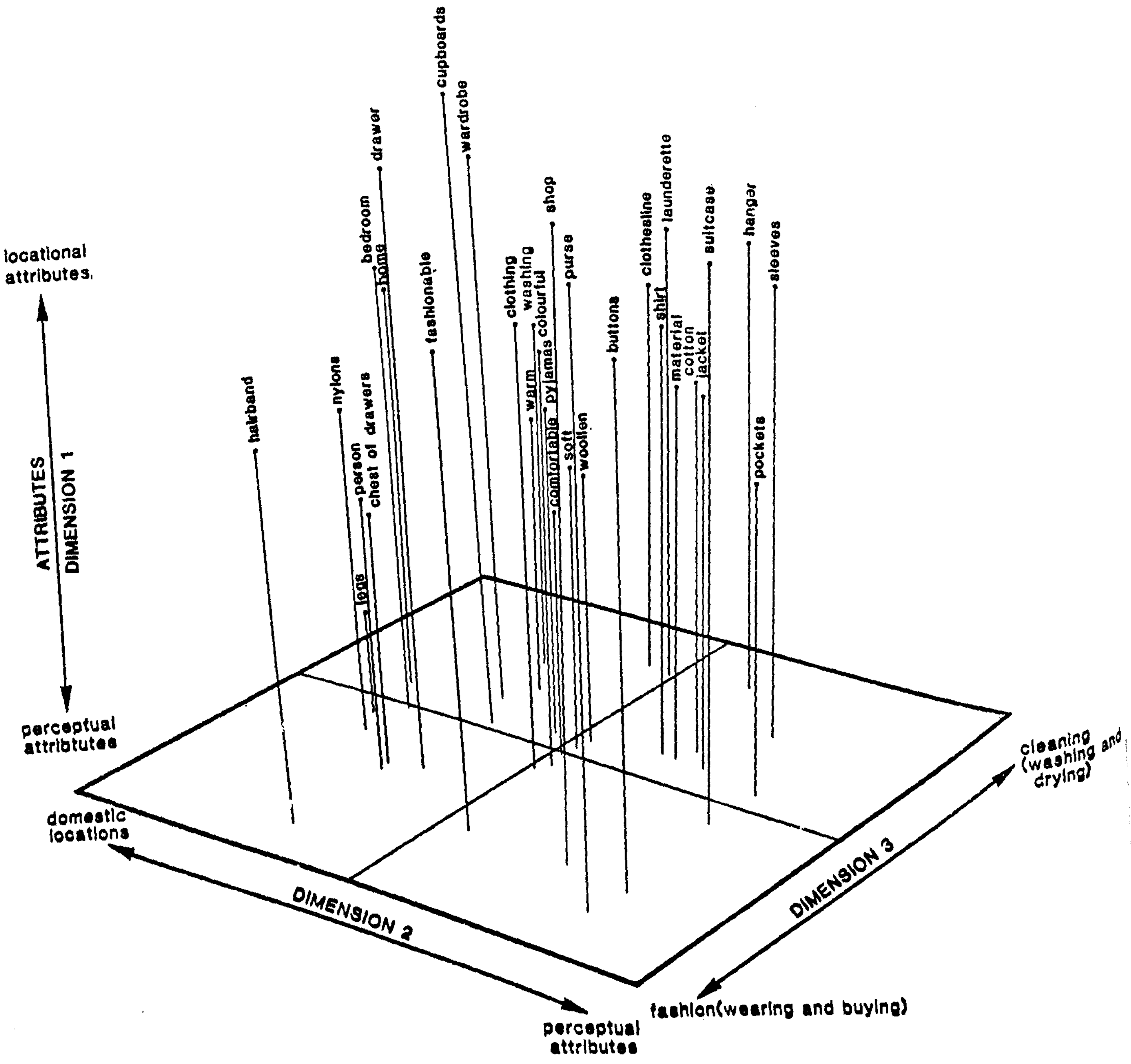


Table 11.3.1 The Three Dimensions Found for the Categories Furniture, and Clothing: Perceptual and Locational Attributes [D=Dimension].

	Furniture	Clothing
D1	Locations/Perceptual Attributes	Locations/Perceptual Attributes
D2	Domestic/Social Scenes	Domestic Locations/ Perceptual Attributes
D3	Functions/Perceptual Properties	Fashion/Cleaning

Table 11.3.2 Averaged Subject Weights: Perceptual and Locational Attributes.

Category	Dimension 1	Dimension 2	Dimension 3
Furniture	0.5614	0.4448	0.3768
Clothing	0.5278	0.4649	0.4490

below.

Clothing

Figure 11.3.2 depicts the 3 dimensional solution. RSQ was 0.73 indicating that the model accounted for 73% of the variance. RSQ values for 4 and 5 dimensional solutions were 0.78 and 0.82 respectively. The dimensions here were generally not as distinct as those described above for Furniture. Dimension 1 juxtaposed perceptual attributes with locations. Dimension 2 polarised into Domestic locations and perceptual attributes. Dimension 3 juxtaposed fashion [wearing, buying] with cleaning [washing, drying].

Note the clustering of perceptual attributes, objects, and locations, e.g. 'Legs, Nylons, Bedroom, Home'. Note also that the superordinate 'Clothing' is located toward the center of the configuration indicating that it was not heavily weighted on any of the 3 dimensions. Nevertheless surrounding the superordinate are items associated with the semantic category 'Clothing'. This is discussed further below.

Overall lower dimension solutions produced no higher RSQ than 0.57. Table 11.3.1, below, tabulates the dimensions.

2] Individual Differences

Ss varied little in order of the weighting they attached to the dimensions and Table 11.3.2 presents the averaged subjects weights

It can be seen from Table 11.3.2 that the dimensions were weighted in the order 1,2,3.

The relative subject weights showed little variance and varied between + 0.29 and - 0.34.

These individual differences measures showed that Ss were generally agreed both as to the dimensional structure and to the weighting of dimensions within that structure.

11.12 Discussion

The main finding was that the two predicted dimensions, locations/perceptual attributes and a 'scene' dimension, were observed in both stimulus sets. The location/perceptual attribute dimension was the dominant dimension in both Furniture and Clothing indicating that Ss distinguished different classes of information when making their similarity judgments. Of more intersest was dimension two, in both stimulus sets, where distinctions were drawn between domestic locations and other locations, in furntiture, and between domestic locations and perceptual attributes in Clothing. Within this dimension objects were clustered with locations and associated perceptual attributes suggesting similarity judgments may have drawn on some form of script or scene-like encoding. Note that perceptual attributes were not clustered with locations <u>only</u>, that is they always accompanied an object, suggesting that the actual exemplars were a key component of script/scene representations.

Dimension 3 in the Clothing set implies an underlying structure of actions such as 'buying and wearing' [Fashion] -vs- 'washing and drying' [Cleaning]. One pole on dimension 3 in the Furniture set depicts activities such as buying and selling [auction], eating off, working on, and sitting on, whereas the other pole depicts objects and their associated attributes. Thus the second and third dimensions juxtaposed settings in which objects were found and descriptions of those objects. Dimension one indicated that these two types of clusters maybe relatively independent.

Within the dimensions it was clear that objects, locations, and associated attributes clustered together in ways which implied a setting. This was not true of all the stimuli, for example in Furniture 'metal and wood' were associated regardless of either objects or locations with which they might have been associated. It is not, then, proposed that scripts [Locations] and categories [Perceptual Attributes] were, exclusively, the organizing memory structures underlying these findings. Rather it is suggested that scripts and categories clearly played a part in Ss similarity judgments and interacted with each other. The interaction took the form of locations containing objects and perceptual attributes as in the example 'Telephone, Restaurant, Pub, Glass, Ashtray', [see Figure 11.3.1, above]. Other clusters contained only single classes of information, e.g. 'Soft, Rug, Comfortable, Bed' and 'Furniture Shop, Removal Van, Factory, Workplace, Department Store, Warehouse, Office'.

In summary then there were three main types of clusters observed within the dimensions: 1] Clusters depicting scenes containing objects and some associated perceptual attributes of the object; 2] Clusters containing groups of locations depicting common activities [e.g. working]; 3] Clusters containing objects and associated perceptual attributes. Autobiographical memories in as much as they predominantly contain information about locations would be conected/associated with the memory structures giving rise to cluster types 1 and 2. Semantic memories predominatly containing perceptual information would connect to cluster types 2 and 3. Thus autobiographical and semantic memories of the same object may be connected to each other via script or scene-like semantic memory representations.

One other notable feature of Figures 11.3.1 and 11.3.2 is the slightly different types of clustering attached to each superordinate. Furniture is clustered with a group of largely domestic locations whereas Clothing, at the centre of the configuration, is most closely associated with items of clothing and associated perceptual attributes. This suggests that certain categories may have prototypes that are slightly biased towards a particular class of information. This would seem to make sense if it was accepted that people were primarily concerned with the perceptual aspects of clothing and, in contrast, with the locations of items of furniture.

Overall Conclusions

The main findings were that:

1] Perceptual attributes and locations were represented relatively independently.

2] Perceptual attributes were structured prototypically and separated out into perceptual dimensions.

3] Locations were clustered around common activities and only partially separated out into dimension of scenes. The locative dimensions overlapped with each other.

4] Locational and perceptual attributes partially clustered together suggesting script or scene-like memory structures which 'pointed' to semantic categories of objects and to common activities.

The general model of the relations of semantic structures and autobiographical memories suggested by these findings is that: semantic representaions of a script/scene-like nature 'point' to semantic categories of sets of objects and their associated perceptual attributes. It seems most probable that this connection is via the objects that are typically associated with the script/scene, [afterall none of the above clusters contained <u>only</u> perceptual attributes and locations]. Autobiographical memories connect to the semantic system via script/scene-like representations. The connections here is most probably through information about locations. Thus semantic and autobiographical representations of the same items connect only indirectly to each other.

This type of model offers some account of the differences in image generation times observed in experiment 4 and the property verification times observed in experiment 7 as discussed above.

The status and implications of these findings along with the findings from earlier experiments are discussed in more detail in the final and concluding chapter.

Part 3

Conclusions

CHAPTER 12

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

This chapter summarizes the main findings and a number of conclusions are drawn. Problems and shortcomings of the research are then discussed. Finally the implications of the findings for studies of autobiographical and semantic memory and for studies of categorization and imagery are considered.

12.1 Content Differences: Summary and Conclusions

The central aim of this thesis was to investigate content differences between autobiographical and semantic memories. It was hypothesised that autobiographical memories contained context specific information about objects and activities that had been experienced; whereas semantic memories of <u>the same</u> objects and activities contained context free information. Experiment 3 found that descriptions of images drawn from autobiographical memories contained idiosyncratic perceptual information about the imaged object and information about the context in which the object had been experienced. In particular it was found that autobiographical memories contained information about the location in which an object had been encountered. In contrast descriptions of images drawn from semantic memories predominatly contained general perceptual information about the imaged object; contextual information, and particularly information about the location of objects, were not evident in these descriptions. Thus the hypothesis that autobiographical memories represented context specific information and semantic memories represented context free information was supported. Further to this, experiment 4 found that generating images drawn from semantic memories was facilitated by a prime depicting general perceptual properties of the category of which the imaged object was a member whereas generating images drawn from autobiographical memories were inhibited by such primes. Experiment 7 found that information about the typical locations of objects was verified faster from images of autobiographical memories than from images of semantic memories and that information about the typical perceptual attributes of objects was verified faster from images of semantic memories than from images of autobiographical memories. These findings supported the results of experiment 3 and showed further, that content differences mediated Ss reponses in tasks that did not require descriptions of images. In short all these experiments demonstrated that the two types of memory represented different types of information. Moreover experiment 8 found that locational cues facilitated recall of previously imaged autobiographical memories more than recall of previously imaged semantic memories, whereas perceptual cues facilitated recall of the latter compared to the former. This demonstrated that content differences between autobiographical and semantic memories can effect the process of recall.

It is concluded that autobiographical memories represent experiential context specific information and that semantic memories [of the same items] represent context free, mainly perceptual information, in the form of typical attributes.

12.2 Organizational Differences: Summary and Conclusions

In chapter 6 it was stated that organizational differences between autobiographical and semantic memories would not be directly investigated. Rather it was decided to indirectly investigate such differences between the two classes of memory by varying the rated typicality [experiment 1] of the stimuli. It was hypothesised that semantic memories would be organized in categories in terms of the typicality of the category members whereas autobiographical memories would not, although the nature of the organization of autobiographical memories was not predicted. Experiment 2 found that the rated imagability of autobiographical memories was partly negatively correlated with typicality, whereas the rated imagability of semantic memories was partly positively correlated with typicality. Experiment 2, then, provided tentative support for the organizational hypothesis. Experiment 3 found that there was an overlap within typicality levels in the perceptual attributes contained in descriptions of semantic memories. This pattern was very similar to that observed by Rosch and Mervis [1975], further confirming that semantic memories were organized in terms of typicality. However, from the contextual attribute classes found for descriptions of autobiographical memories, only locational attributes were observed to overlap in a way indicative of semantic typicality effects. This suggested that autobiographical memories of common items generally consisted of information that did not overlap in a manner similar to semantic memories and therefore that autobiographical memories were not organized in terms of semantic typicality. The locational attribute overlap was taken as indicating that autobiographical memories may connect to semantic representations of locations. It was reasoned that the locational information contained in autobiographical memories although context specific provided a link to context free semantic representations of locations and this is discussed further in the next section. Experiment 4 found that image generation times [IGTs] for images of semantic memories were subject to strong semantic typicality effects. IGTs to unprimed images of autobiographical memories did not exhibit similar semantic typicality effects. These [no-prime] findings were replicated in experiment 7. The pattern of IGTs to autobiographical memories suggested that autobiographical memories were organized, at least in part, in terms of recency of encoding. Experiment 5 found that ratings of the recency with which objects had been encountered were distributed in a manner very similar to that previously observed for autobiographical IGTs lending some support to the inference that autobiographical memories were organized in terms of recency of encoding.

It is concluded that the representation of semantic memories of common objects and activities are organized in categories in terms of typicality and attribute overlap [as in the general model of categorization specified in chapter 4]. Autobiographical memories of the same objects and activities, were not organized in similar categories nor were they organized in terms of typicality and attribute overlap, except in the case of locational information. It is concluded that autobiographical memories may be organized, at least in part, in terms of recency of encoding. However autobiographical memories do appear to contain semantic information about locations and/or connect directly to semantic representations of locations.

12.3 Connections Between Autobiographical and Semantic Memories: Summary and Conclusions

In part 1 of this thesis Tulving's [1972; 1983] functional separation of episodic and semantic memories was rejected and a unitary model of memory which emphasised the connectivity of memories in a single network was adopted. Consequently it was decided that part of the research should, albeit briefly, address the question of connections between autobiographical and semantic memories. It was reasoned that, as autobiographical memories had been found to contain information about locations that partly exhibited semantic structure [experiment 3] and that autobiographical memories facilitated judgments about locations drawn from norms that had a semantic structure [experiment 6], then autobiographical memories may contain and /or connect to semantic memories of locations. However these two possibilities were not directly investigated, rather Experiments 9, 10, and 11, examined the structure of the semantic representation of perceptual and locational attributes and inferred the connections from the observed structures.

Experiments 9 and 10 found that perceptual attributes were organized primarily in terms of prototypes whereas locational attributes were organized in terms of groups of locations in which similar actions would typically be performed [scripts]. Strongly suggesting that both classes of attributes are separately represented in semantic memory. Experiment 11 found that perceptual and locational attributes together were organized in both the previously mentioned ways and, in addition, in terms of 'scenes' which partially specified objects. In as much as autobiographical memories contain locational information they may, then, connect to scene-, or script-, like semantic representations. These representations connect to other, context free, semantic memories which are contained in semantic categories organized in terms of typicality and centred around a [perceptual] prototype.

A problem here is that it is not clear why locational information should provide a direct link between autobiographical and semantic memories when autobiographical memories contain other classes of information that could, potentially, have provided links to semantic memories. One explanation is that autobiographical memories act as instantiations of scripts [see 12.6 below for further discussion of this point] and their predominant overlap with scripts is in the form of information about locations. Related to this it might plausibly be argued that locative information is generally less idiosyncratic than other types of information i.e. perceptual attributes. It will be recalled that experiment 3 found that the second most dominant class of information contained in descritpions of autobiographical memories was that of idiosyncratic perceptual attributes which, because of their highly individual nature, exhibited very little overlap. Locative information contained in autobiographical memories although context specific may then, be less idiosyncaratic that other classes of context specific information and hence overlap more extensively with corresponding context free semantic information. Thus it was concluded that locative information is represented in both classes of memory but in autobiographical memory is context specific and in semantic memory is context free.

The central point of chapter 11 is then, that corresponding autobiographical and semantic memories are indirectly connected to each other by way of script like semantic representations of locations.

12.4 The Semantic/Episodic Distinction [SED] Reconsidered.

The revised version of SED that research reported in this thesis has converged on contains the following four points: a] episodic memories are best conceived of as autobiographical memories; b] autobiographical and semantic memories represent different types of information; c] autobiographical and semantic memories are differently organized; and d] that autobiographical and semantic memories are interconnected and, hence, may be represented in a unitary memory network. This version of SED [hereafter refered to as SAD, semantic/autobiographical distinction] contains as its central tenet that semantic and autobiographical memories differ <u>primarily</u> in terms of <u>representation</u> rather than in terms of <u>process</u>. Representational differences such as what information is represented by a class of memories and how that information is organized constitute the main diagnostic features of SAD. [Note the use of the term 'representation' here, is somewhat different from the use of this term by other researchers [e.g. Anderson, 1978; Kosslyn, 1980]: these researchers have generally used the term 'representation' to refer to the 'code' in which information is represented. However this thesis has little to contribute towards issues relating to coding. Rather it is simply proposed that content and organizational factors are more related to representational issues than to processing issues [c.f. Rosch, 1978, for discussion of organization and representation] and it is in this sense that content and organization are classed with representational issues]. Process differences are not excluded from SAD but it is argued that as past work [see chapter 2] has failed to unequivocally establish process differences then the diagnostic status of process differences for SAD has yet to be established. It may, of course, be the case that future research will determine that different processes operate upon different types of representations in which case process differences might be incorporated into SAD.

The chief advantage of SAD over SED is that processing issues which have proved intractable to investigation are made less central to the distinction and representational differences, which in this thesis have been found to be more efficacious, become central to the distinction. This leads to a number of smaller advantages of SAD over SED which are also important. Firstly clear differences between the two classes of memory can be established e.g. content and organizational differences. Secondly well established representational differences may act to stimulate research into process differences. Thirdly, as SAD emphasises connections between the two classes of memory, research into the connectivity of classes of memory may also be stimulated. [It was noted in chapter 2 that SED's emphasis on 'functional independence' had acted to discourage studies of interconnections between the two classes of memory].

In summary SAD by emphasising representational differences and de-emphasising process differences suggests ways in which autobiographical and semantic memories may be clearly differentiated and ways in which the two classes of memory may be connected.

However at the centre of SAD is the controversial assumption that representations and processes can be clearly distinguished. As mentioned previously [chapter 5] Anderson [1978] has argued that imagery based accounts of cognition can not be <u>theoretically</u> distinguished from other, non-imagery, accounts e.g. propositional accounts. Anderson extended this argument to the representational/process distinction [RPD] pointing out that any effect may be accounted for with equal facility by either process or representational models. Within the literature there seem to be two more or less explict reponses to RPD: a] the first response is simply that RPD is a non-issue which, at best, merely indicates terminological preferences [c.f. Collins and Loftus, 1975; Hollan, 1975; Smith, 1978; for slightly indirect discussions of RPD]. Yet as RPD has been so rarely discussed this position tends to be implicit in the approach taken by researchers to specific issues. For example Tulving's account of ecphoric synergy [1983] throughly conflates representational and process issues in a way that suggests that Tulving draws no sharp distinstinction between the two; b] the second reponse perhaps best articulated by Kosslyn [1978] acknowledges that RPD may at some future point constitute a theoretically significant distinction but in its current formulation is at best pre-theoretical. Nonetheless Kosslyn [1978] argues that RPD may be a useful distinction for stimulating research by providing a way of conceptualizing, or of discussing, possible differences between various types of cognition.

The concept of SAD, as outlined above, takes this second approach to RPD: representational and process distinctions constitute a way of thinking about differences between autobiographical and semantic memories which may 'drive' research. Certainly the research reported in this thesis has been able to establish differences between autobiographical and semantic memories by distinguishing representational and process approaches to the two classes of memory and investigating hypotheses more closely associated with representational differences than with process differences.

12.5 Methodological Problems

Although the findings supported the content and organizational hypotheses and provided some support for the hypothesised connection between the two classes of memory, there were a number of problems related to the research generally. Firstly there was no independent way in which to verify that Ss had generated images. However, in experiment 3, Ss descriptions of images included and omitted information in a way that strongly implied that images had been generated e.g. attributes of objects which would not have been explicitly depicted in the image were not included in Ss descriptions. This problem of verfying imagery is not specific to the present research and extends to all studies employing imagery. Although Ss in the present research may not have generated images the effects observed consistently indicated that the memories mediating the responses differed in the predicted manner. Thus whether Ss did or did not generate images the autobiographical and semantic memories they employed in making their responses exhibited characteristically different content and organization.

Related to this it was difficult to envisage how autobiographical and semantic memories <u>of the same items</u> could have been accessed by any common process other than imagery. In the past semantic memories have typicaly been accessed by requiring Ss to make semantic judgments whereas autobiographical memories have been accessed by simply asking Ss to recall personal memories. These techniques were clearly inappropriate given that the aim of this thesis was to study autobiographical and semantic memories of the same item, [this was one of the main points of chapter 2]. For this reasons it was considered that imagery, although theoretically and methodologically problematic, constituted the most efficacious way in which to investigate the experimental hypotheses.

A further problem related to imagery was that of individual differences in image abilities. Subjects effects were observed in experiment 4 indicating that different Ss generated images more or less quickly. As this effect did not interact with any other effects, it was concluded that image ablities had not obscured or confounded the experimental manipulations. However it was clear that a few Ss whose image generation times were considerably slower than all other Ss acted to raise mean image generation times overall. To minimize the effect of slow imagers upon the experimental manipulations image generation times in all experiments were log transformed but although this reduced the effect of such 'outliers' it was recognized that a more direct pre-experimental measure of Ss image abilities may have been employed to eliminate this source of variance. Clearly it would have been preferable had there been some way of assessing Ss image abilities, but as Richardson [1980] has pointed out, none of the current imagery questionnaires and tests have been found to reliably assess Ss imagery abilities. In addition none of these tests have attempted to assess Ss abilities to generate images drawn from different memory classes. Hence, short of developing such a test, there was no way in which to control for individual differences in imagery abilities.

A potentially more serious problem related to the possibility that Ss may have been unable to generate a specific typical or personal instance image and may, consequently, have generated an image from an inappropriate memory, e.g. drawn on a semantic memory when generating personal instance images and/or vice versa. In the studies reported above it was assumed that if such a use of inappropriate memories had been frequent then the predicted experimental effects would have been obscured. As the predicted experimental effects were observed it was concluded that use of inappropriate memories had not been frequent. Furthermore the selection of highly imagable personal and typical instance stimuli at least controlled for imagability of the two classes of memory. One way in which the nature of Ss' images might have been more precisely determined would have been to require Ss to describe their images immediately after they had completed [each trial of] the experiment. However this would have produced very lengthy experimental runs with concomitant problems of subject fatigue. In any case this measure would only have facilitated checks on the data and it was difficult to envisage ways in which Ss may have been more effectively induced to generate the required image other than by means of varying the experimental instructions.

It might be argued that the stimuli could have been manipulated in order to compel Ss to draw more directly on autobiographical and semantic memories. For example Ss could have been asked to generate images of scenes which they were known to have experienced and been asked to generate corresponding typical instance images of the same scenes. In chapters 3 and 4 it was argued that as little was known about the semantic representation of scenes the use of such stimuli would have greatly complicated the research which would have had to establish the nature of semantic representation of scenes as well as the nature of autobiographical representation of scenes. Further much of the research would have been concerned with collecting data about events which Ss had experienced. The stimuli used in the above research obviated many of these problems simply because it could be reasonably assumed that all Ss would have encoded both semantic and autobiographical memories of common everday items. For these reasons it was concluded that the stimuli, although possibly not as effective in accessing autobiographical memories as other stimuli, were best suited to the research aims. Manipulating stimuli to optimize access to different types of memories is, however, consider further in section 12.6 below.

One final point related to the use of between Ss designs. All the experiments [except experiment 5] employed between Ss designs. The reason for this was, that in a pilot study to experiment 4 employing a within Ss design, it was found that Ss became confused as to the nature of the images they were required to generate. Ss complained that they found it difficult to generate the required image and had to suppress inappropriate images. One reason for this may have been that the two classes of memory, when activated in the same time period, competed for image generation. Thus it was concluded that within Ss designs obscured the experimental effect and hence the adoption of between Ss designs. Yet within Ss designs might have been effectively used had Ss performed the experimental tasks some days or weeks apart by which time Ss might have forgotten the first imagery instructions. However it was unclear how effective this procedure would have been and the time taken to perform the experiments would have been prohibitive. The main disadvantage of the between Ss design was that there was no way in which to verify that Ss were in fact generating images in both conditions. Conceivably it could have been the case that Ss systematically generated images in one condition but not in another. For the present purposes this is not such a challenging criticism as long as it can be assumed that Ss drew on autobiographical memories in one condition and semantic memories in the other condition and the findings strongly indicate that this was what Ss did. Further the evidence from experiment 3 strongly suggested that Ss had generated images and informal post-experimental interviews after each experiment also indicated that Ss in both conditions had generated images. Although the criticism that some or all Ss may have sytematically failed to generate images cannot be completely ruled out, for the reasons specified above this is considered both unlikely and not neccessarily fatal for the interpretation of the findings.

12.6 Autobiographical Memory: Implications and Future Research

The central finding was that autobiographical memories represented experiential context specific information comprised of information about locations, idiosyncratic perceptual information, and information about time, actors, and actions. Evidence was also found indicating that autobiographical memories connected more directly to script-like semantic representations than to semantic categories. As already noted these findings suggest that autobiographical memories may act as instantiations of scripts much as exemplars act as instantiations of semantic categories. If future research were to establish that this were the case then it could be maintained that scripts are involved in the encoding of autobiographical memories. If autobiographical memories are encodings of the cognitive environment, as Tulving [1983] proposes, then presumably scripts may act as an organizing parameter at input. Hence it would not be suprising to observe that autobiographical memories connect more directly to scripts than to other semantic structres. Yet although this this may be the case for autobiographical memories of objects for reasons to be outlined below, it is not proposed that <u>all</u> autobiographical memories function as instantiations of scripts.

It was also found that autobiographical memories contained information that could not be classified as contextual such as evaluative judgments of the imaged object e.g. 'a not very nice shirt' [experiment 3]. The stimuli employed in the above studies had been selected because it was judged that they were less likely to predisopose Ss to bring to mind autobiographical memories with a highly emotional content and more likely to dispose Ss to bring to mind recently encoded autobiographical memories. However it may have been the case that autobiographical memories of items other than common everday objects were dominated by other types of, or different combinations of, contextual information. For instance autobiographical memories of events may be dominated more by information about actors, actions, times, and the consequences of the event for the person [Brown and Kulik, 1977], rather than by information about locations and perceptual idiosyncracies. Similarly less recent autobiographical memories, perhaps encoded during childhood, may have remained distinct in memory because of their emotional rather than contextual content. There may then, be other classes of autobiographical memories distinguishable by the information they contain, which have not been investigated in this thesis. It remains to be established whether autobiographical memories of, for instance, a highly emotional nature function as instantiations of script-like semantic memories.

Questions relating to the content of different types of autobiographical memory are closely bound up with issues concerning the organization of autobiographical memories and these issues are considered next. Although the research reported above did not directly investigate the organization of autobiographical memory it was found that autobiographical memories were not organized in categories in terms of typicality in a manner similar to that of semantic memories. Rather it appeared that autobiographical memories were organized in terms of recency of encoding. Yet this may have been specific to the type of stimuli used namely, common everyday objects, which because they had been relatively recently encountered were represented in terms of recency of encoding. Other autobiographical memories of these stimuli may have been present but not employed possibly because in the context of the research speed of image generation was heavily emphasised and so Ss drew on the most available autobiographical memory. Less recently encoded autobiographical memories may not, then, be subject to similar recency effects. Whitten and Leonard [1981] found that Ss employed categories of autobiographical memories, [e.g. english teachers], in recalling long established memories of their school teachers. As previously touched upon, experiment 3 found that descriptions of autobiographical memories contained more information classified as 'other' than did descriptions of semantic memories. This 'other' information was largely comprised of evalulative attributes such as 'an <u>expensive</u> shirt', 'an <u>evil</u> <u>looking</u> blackbird', 'a <u>delicious</u> apple', and so on. Possibly, then, some of the autobiographical memories upon which Ss drew to generate their images were taken from categories of autobiographical memories such as 'delicious things', 'expensive things', and 'ugly things'. If so, it may be that autobiographical memories are organized in categories which are dissimilar to semantic categories. As virtually nothing is known concerning autobiographical memory categorization it is difficult to assess what effect this may have had on the research reported in this thesis. In the light of the evidence that Ss had employed recently encoded autobiographical memories [experiments 4 and 5] it was tentatively concluded that autobiographical memory categorization was only peripherally involved in memory access. However if some autobiographical memories are organized in 'evaluative' categories it is difficult to imagine how such categories stand in relation to script-like semantic structures. One plausible argument is that only non-categorized recent autobiographical memories act as instantiations of scripts: over time autobiographical memories are either recoded [c.f. Tulving, 1983] into autobiographical memory categories or simply 'written over' by newer encodings. Thus the connection between autobiographical and semantic memories [indirectly] observed in this thesis may relate only to recently encoded autobiographical memories of common objects.

Greenwald [1981] has proposed that autobiographical memories may be organized in terms of their centrality to the self-system. One of the criticisms of past work, noted in chapter 2, into the semantic/episodic distinction was that the episodic memories which had been the focus of previous studies had a high semantic content and hence differences between semantic and episodic memories had been obscured. In the light of Greenwald's proposal it might be argued that these [semantic] episodic memories were low in autobiographical content because of their lack of significance for, and hence centrality to, the self-system. The suggestion is that autobiographical memories which are central to the self-system may be more distinct from semantic memories than those which are less central to the self-system. One shortcoming of the present research was that no attempt was made to independently assess whether the autobiographical memories drawn upon were all equally autobiographical. One possible way of controlling/assessing this variable would have been to have Ss rate the personal 'content' and/or 'significance' of their images. However the development and validation of such a rating procedure would have constituted a separate thesis. Hence the criticism remains that the autobiographical memories drawn upon in the research reported in this thesis may have been low in semantic content [hence the predicted effects] but less central to the self-system than other autobiographical memories. If so some of the observed effects, and in particular the recency effect, may have been specific to the type of autobiographical memories selected for study. A corollary of this line of argument is that most autobiographical memories are organized in relation to the self-system rather than in relation to semantic memories [e.g. scripts]. Future research then might profitably investigate autobiographical memory organization and content by examing autobiographical memories of varying centrality to the self-system.

The foregoing discussion has raised two issues of central importance for future research. The first issue is that there may be sub-groups of autobiographical memories that are distinguishable by the content of the information that they represent. The techniques of image description, priming imagery, and image mediated property verification employed in this thesis could be extended to explore the content of these different types of autobiographical memories. The second issue, which is closely related to the first, is that of the nature of autobiographical memory organization. One of the important outcomes of the research reported in this thesis is that it has drawn attention to the largely unstudied area of autobiographical memory organization. In conclusion it is proposed that more research into autobiographical memory content will suggest ways in which autobiographical memories are organized.

12.7 Semantic Memory: Implications and Future Research

One of the main points for the study of semantic memory arising from the research reported in this thesis concerns the semantic representation of scripts and scenes. The findings of experiment 11 indicated that semantic representation of locations were clustered around common actions [scripts] and/or clustered in a way suggesting a scene, raising the questions of how scripts and scenes are related and, of how, if at all, semantic representations of scripts and scenes differ. According to Schank [1983] scripts are characterised as subsumimg scenes. However detailed investigation of these hypothetical semantic structures has yet to be undertaken and Schank's proposals remain provisional. Moreover experiment 11 provided no direct evidence for Schank's proposal. One plausible suggestion concerning differences between the two semantic structures is that scripts represent <u>procedural</u> knowledge about typical action sequences [e.g. eating at a restaurant] whereas scenes represent typical <u>declarative</u> knowledge about locations [e.g. what a restaurant looks like]. Experiment 11 tentatively suggested that future research might profitably concentrate on differences between these two classes of semantic memory.

Concerning procedural knowledge it might be speculated that the semantic representation of actions is context free as Bower et al's work suggested [see chapter 4]. If this were found to be the case then it might be further hypothesised that SAD applies to procedural as well as declarative knowledge [c.f. discussion of multistore models in chapter 2]. Autobiographical memories of actions may contain context specific information [e.g. eating at a particular restaurant] whereas semantic memories may contain context free information [e.g. about what typically happens when eating at a restaurant]. This goes against Tulving [1983] who argues that the procedural/declarative distinction is orthogonal to SED and that SED only applies to declarative knowledge. Again future research might address the question of whether SAD cross cuts the procedural/declarative distinction.

In conclusion the research reported in this thesis supports the claim that there are different classes of semantic memories and suggests that future semantic memory research might focus on these somewhat neglected semantic structures.

12.8 Categorization: Implications and Future Reseach

Chapter 4 showed that previous research had been exclusively concerned with the semantic representation of categories and that the role of autobiographical memories in semantic categorization had been, largely, ignored. The present research found that autobiographical memories were not subject to typicality effects similar to those observed for semantic memories and that autobiographical memories did not appear to access corresponding semantic memories although they may have indirectly connected to them. This implied that autobiographical memories were not closely involved in semantic categorization.

Yet autobiographical memories have been implicated in the development of semantic categories and semantic memory generally [c.f. Nelson, 1978]. Developmental psychologists [Petrey 1977; Nelson 1978; 1979; 1974; see chapter 2] subscribe to the view that semantic memories are abstracted from autobiographical memories. In the light of the present finding that autobiographical memories connect most directly to semantic structures other than semantic categories it seems that semantic memories must develop from autobiographical memories via semantic representations of scene- or script- like semantic structures which pre-date the development of semantic categories. Support for this conjecture comes from Nelson [1978] who reported finding that children developed representations of scenes before representations of categories. Thus autobiographical memories may be implicated in the development and acquisition of semantic memories. However once the two types of memory have been establised it appears that they are only indirectly connected and, therefore, may be accessed independently.

12.9 Imagery: Implications and Future Research

A strong test of the generality of current imagery theorizing [i.e. that images are transitory data structures generated in an imagery medium that has 'priviliged' properties] would be to investigate whether the imagery effects observed for semantic memories generalize to autobiographical memories. In chapter 5 the point was made that previous research into imagery had focused, almost exclusively, on images drawn from semantic memories [see Tulving, 1983, quoted in chapter 5]. It may be the case that the 'priviliged' properties of the imagery 'medium' apply only to images drawn from semantic memories. For example a common finding has been that more complex images take longer to generate than less complex images [c.f. Kosslyn, 1980]. The explanation given for this effect by Kosslyn is that complex images have more 'parts' which must be 'read' into the imagery medium and hence take longer to generate. However one of the findings of experiments 4 and 7 was that images drawn from autobiographical memories were generated more quickly than images drawn from semantic memories. Yet it might be argued on the basis of the findings of experiment 3 that autobiographical memories gave rise to more complex images than their semantic counterparts, questioning Kosslyn's interpretation of complex image generation. One explanation, a la Kosslyn, for the findings of experiments 4 and 7 would be that most autobiographical memories, but not all, are representend in a literal format whereas most semantic memories, but not all, are represented in a propositional format. Thus images of semantic memories are constructed from a propositional list of attributes read individually into the imagery mediun whereas autobiographical memories are read whole into the imagery medium. If this is the case other priviliged properties of imagery might be observed to be specific to semantic memories. For example images drawn from autobiographical memories may not be amenable to mental rotation or, if they are, they may not exhibit a one to one isomorphism with the imaged object as do images drawn from semantic memories [Shepard and Metzler, 1974]. Also autobiographical memories, if they are literal, may not 'fade' in the manner described by Kosslyn [1980] i.e. in discrete parts. Possibly autobiographical memories fade completely over time and must be wholly regenerated. Note that all these hypothetical differences relate to differences in imagability between the two classes of memory. It is not proposed that that this type of research would question the priviliged properties of the imagery medium. The central point is that a model of memory that incorporates distinctions between classes of memory may give rise to an expanded model of imagery.

In conclusion the research reported in this thesis suggests that future studies of imagery might examine the generalizability of imagery effects to memories other than the semantic. This would constitute a strong test of current theories of imagery.

12.10 Summary of Conclusions

It was concluded that autobiographical and semantic memories of the same items differed in terms of the information that they contained. It was also concluded that semantic memories were organized in semantic categories whereas autobiographical memories were organized, at least in part, by recency of encoding. Finally it was concluded that autobiographical and semantic memories of the same items did not connect directly to one and other but, rather, connected via scene-, or script-, like semantic representations.

These findings supported a revised semantic/episodic distinction which emphasised content and organizational differences between the two classes of memory.

Implications of the research were discussed and it was concluded that: a] future studies of autobiographical memory should investigate the content of a wider range of autobiographical memories and should address the issue of the organization of autobiographical memories; b] that future studies of semantic memories should be extended to semantic structures other than semantic categories; c] that future studies might more closely examine the development of semantic memories and the role of autobiographical memories in that development; d] that theories of imagery may be tested in research that attempts to extend imagery effects to images drawn from autobiographical memories.

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APPENDIX A

Table A.1

This table contains the goodness-of-example category norms reported in experiment 1, chapter 7. On each page appear the ratings from one category. The categories are presented in alaphabetical order: Bird, Clothing, Fruit, Furniture, Sport, Toy, Vegetable, Vehicle, Weapon. Next to each exemplar are the mean rating, ranking, and ranking found by Rosch [1975(b)], in that order.

Goodness-Of-Example Norm For The Category BIRD

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
robin	1.11	1.	1.
blackbird	1.14	2.	6.
sparrow	1.16	3.	2.
thrush	1.43	4.	23.
swallow	1.44	5.	9.
starling	1.48	6.	16.
eagle	1.54	7.	17.5
wren	1.57	8.	13.5
pigeon	1.60	9.	22.
seagull	1.63	10.	20.
crow	1.67	11.	25.
dove	1.70	12.	7.
lark	1.81	13.	8.
finch	1.85	14.	15.
raven	1.87	15.	27.
owl	1.92	16.	37.
woodpecker	2.02	17.	21.
goldfinch	2.04	18.	28.
hawk	2.07	19.	26.
falcon	2.21	20.	24.
canary	2.27	21.	5.
swan	2.65	22.	43.
stork	2.78	23.	41.
pheasant	2.84	24.	31.
albatros	2.86	25.	34.
peacock	2.90	26.	46.
hummingbird	2.92	27.	19.
bluebird	2.98	28.5	4.
parrot	2.98	28.5	29.
duck	3.02	30.	45.
sandpiper	3.25	31.	30.
vulture	3.32	32.	40.
buzzard	3.34	33.	42.
bluejay	3.39	34.	3.
mockingbird	3.45	35.5	12.
parakeet	3.45	35.5	10.
flamingo	3.50	37.	44.
geese	3.65	38.	39.
chicken	3.73	39.	48.
crane	3.75	40.	33.
pelican	3.87	41.5	38.
turkey	3.87	41.5	49.
toucan	4.03	43.	36.
condor	4.10	44.	35.
ostrich	4.11	45.	50.
penguin	4.17	46.	53.
titmouse	4.55	48.	51.
redbird	4.83	49.	13.5
egret	4.99	50.	47.
oriole	5.27	51.	11.
cardinal	6.14	52.	17.5
catbird	6.21	53.	32.
bat	6.45	54.	54.

Goodness-Of-Example Norm For The Category CLOTHING.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
jacket	1.24	1.	8.
shirt	1.25	2.	2.5
sweater	1.27	3.	10.
skirt	1.29	4.	4.
suit	1.34	5.	6.
jumper	1.35	6.	14.5
coat	1.42	7.5	9.
dress	1.42	7.5	2.5
blouse	1.58	9.	5.
pants	1.77	10.	1.
sweatshirt	1.85	11.	11.
overcoat	1.88	12.	20.
panties	1.92	13.5	14.5
sports jacket	1.92	13.5	13.
raincoat	1.95	15.	22.5
bra	2.03	16.	26.
underpants	2.09	17.	12.
socks	2.11	18.	16.
slacks	2.16	19.	7.
vest	2.48	20.	30.
stockings	2.55	21.	29.
nightgown	2.75	22.	21.
shoes	2.71	23.	27.
slip	2.77	24.	25.
parka	2.82	25.	17.
pyjamas	2.87	26.	18.
cape	3.22	27.	32.
nylons	3.25	28.5	31.
undershirt	3.25	28.5	19.
bathrobe	3.30	30.	24.
tie	3.39	31.	35.
sandals	3.41	32.	34.
bathing suit	3.43	33.	22.5
boots	3.47	34.	33.
gloves	3.52	35.	43.
slippers	3.58	36.	40.
hat	3.65	37.	41.
scarf	3.69	38.	38.
apron	3.96	39.	44.
mittens	3.98	40.	39.
girdle	4.21	41.	36.
tuxedo	4.27	42.	28.
belt	4.45	43.	37.
overshoes	4.72	44.	42.
earmuffs	5.67	45.	45.
handkerchief	5.83	46.	46.
watch	5.98	47.	50.5
hairband	6.06	48.	48.
ring	6.20	49.	49.
earrings	6.25	50.	50.5
necklace	6.30	51.	53.
cufflinks	6.31	52.	52.
bracelet	6.40	53.	54.
purse	6.47	54.	47.
cane	6.65	55.	55.

Goodness-Of-Example Norm For The Category FRUIT.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
apple	1.15	1.	2.
orange	1.24	2.	1.
strawberry	1.26	3.	11.
peach	1.30	4.5	4.
pear	1.30	4.5	5.
plum	1.38	6.	8.
banana	1.39	7.	3.
tangerine	1.42	8.	6.5
grapes	1.44	9.	9.
apricot	1.63	10.	6.5
raspberry	1.64	11.	19.
blackberry	1.67	12.5	16.
cherry	1.67	12.5	14.
pineapple	1.76	14.	15.
lemon	1.77	15.	20.
grapefruit	1.82	16.	12.
gooseberry	2.01	17.	36.
melon	2.23	18.	17.
lime	2.46	19.	25.
watermelon	2.66	20.	23.
pomegranate	2.72	21.	32.
passion fruit	2.93	22.	33.5
nectarine	3.30	23.	10.
cranberry	3.35	24.	33.5
berry	3.41	25.	13.
honeydew	3.57	26.	28.
avacado	3.79	27.	44.
date	3.82	28.	37.
blueberry	3.84	29.5	18.
prunes	3.84	29.5	35.
pawpaw	4.10	31.	42.
fig	4.13	32.5	29.
raisin	4.13	32.5	39.
black raspberry	4.14	34.	21.
mango	4.18	35.	30.
tomato	4.30	36.	46.
coconut	4.56	37.	43.
pumpkin	5.05	38.	45.
guava	5.08	39.5	31.
muskmelon	5.08	39.5	40.
papaya	5.25	41.	27.
cantaloupe	5.37	42.	24.
olive	5.57	43.	49.
nut	5.70	44.	47.
gourd	5.72	45.	48.
boysenberry	5.85	46.	22.
squash	5.87	47.	51.
tangelo	5.90	48.	26.
kumquat	5.96	49.	38.
persimon	6.10	50.	41.
pickle	6.64	51.	50.

Goodness-Of-Example Norm For The Category FURNITURE.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
table	1.23	1.	3.5
chest of drawers	1.27	2.	11.
chair	1.28	3.	1.5
bed	1.29	4.5	13.
sofa	1.29	4.5	1.5
easy chair	1.33	6.	5.
couch	1.52	7.	3.5
desk	1.77	8.	12.
dresser	1.90	9.5	6.5
rocking chair	1.90	9.5	6.5
coffee table	1.98	11.	8.
cupboard	2.01	12.	39.
bookcase	2.05	13.5	22.
stool	2.05	13.5	32.
cabinet	2.09	15.	27.
bureau	2.34	16.5	14.
chest	2.34	16.5	19.
divan	2.36	18.	17.
drawers	2.48	19.	34.
cedar chest	2.78	20.	20.
bench	2.82	21.	29.
footstool	2.91	22.	26.
chaise lounge	3.01	23.	24.
end table	3.04	24.	15.5
rocker	3.17	25.	9.
night table	3.27	26.	18.
shelf	3.74	27.	44.
china closet	3.75	28.	28.
ottoman	3.76	29.	25.
piano	3.85	30.	35.
closet	3.86	31.	56.
lamp	4.30	32.	31.
magazine rack	4.33	33.	37.
love seat	4.36	34.	10.
mirror	4.48	35.	41.
rug	4.49	36.	45.
stove	4.56	37.	50.
stereo	4.70	38.	40.
refrigerator	4.73	39.	54.
waste basket	4.75	40.	47.
drapes	4.82	41.	53.
picture	4.87	42.	55.
television	4.87	43.	42.
clock	4.92	44.	52.
hi-fi	4.93	45.	38.
counter	4.96	46.	51.
davenport	5.04	47.	15.5
cushion	5.07	48.	36.
buffet	5.12	49.	30.
bar	5.23	50.	43.
radio	5.33	51.	48.
sewing machine	5.43	52.	49.

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Goodness-Of-Example Norm For The Category FURNITURE

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
vanity	5.68	53.	21.
telephone	5.69	54.	60.
vase	5.70	55.	57.
lounge	5.98	56.	23.
ashtray	6.01	57.5	58.
pillow	6.01	57.5	46.
fan	6.19	59.	59.
hassock	6.25	60.	33.

Goodnesss-Of-Example Norm For The Category SPORT.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
football	1.29	1.5	1.
tennis	1.29	1.5	4.
rugby	1.35	3.	8.
squash	1.55	4.	22.5
badminton	1.67	5.	24.5
cricket	1.70	6.	22.5
hockey	1.75	7.	9.
basketball	1.76	8.	3.
swimming	1.81	9.	11.
running	1.95	10.	42.
baseball	2.01	11.	2.
pole vault	2.11	12.	26.
volleyball	2.13	13.	14.
ice hockey	2.21	14.	10.
gymnastics	2.23	15.5	21.
skiing	2.23	15.5	16.
golf	2.29	17.	17.
racing	2.37	18.	24.5
boxing	2.39	19.	13.
car racing	2.91	20.	37.
bowling	2.92	21.	28.
water skiing	2.97	22.	29.
canoeing	3.01	23.5	6.
weight lifting	3.01	23.5	45.
judo	3.03	25.	36.
horse racing	3.08	26.	43.
archery	3.13	27.	35.
rowing	3.18	28.5	39.
sailing	3.18	28.5	33.
fencing	3.21	30.	27.
ice skating	3.23	31.	30.
polo	3.27	32.	18.
ping pong	3.29	33.	38.
skating	3.32	34.	31.
softball	3.34	35.	5.
diving	3.36	36.	34.
lacrosse	3.40	37.5	15.
wrestling	3.40	37.5	20.
track	3.53	39.	12.
surfing	3.59	40.	19.
handball	3.74	41.	7.
fishing	3.83	42.	40.
horseback riding	3.89	43.	41.
skindiving	3.91	44.	32.
hiking	4.25	45.	44.
billiards	4.31	46.	50.
croquet	4.37	47.	46.
boating	4.39	48.	48.
pool	4.78	49.	49.
hunting	4.88	50.	51.
checkers	5.48	51.	56.
chess	5.52	52.	54.

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Goodnesss-Of-Example Norm For The Category SPORT

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
jump rope	5.63	53.	52.
camping	5.81	54.	53.
cards	5.84	55.	57.
dancing	5.92	56.	55.
horseshoes	6.16	57.	47.
sunbathing	6.92	58.	58.

Goodness-Of-Example Norm For The Category TOY.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
teddy bear	1.27	1.	11.
doll	1.44	2.	1.
toy soldier	1.56	3.	3.5
doll house	1.64	4.	13.
ball	1.70	5.	14.
rocking horse	1.75	6.	12.
yo-yo	1.79	7.	5.
kite	1.91	8.	23.
jack-in-the-box	1.93	9.	3.5
water pistol	2.01	10.	10.
marbles	2.14	11.	7.
top	2.25	12.	2.
rattle	2.27	13.	8.
tricycle	2.40	14.	25.
football	2.51	15.	35.
stuffed animal	2.56	16.	9.
colouring book	2.58	17.	26.
paper dolls	2.69	18.	16.
puzzle	2.71	19.	29.
game	2.73	20.	36.
crayons	2.74	21.	27.
swing	2.75	22.	37.
train	2.75	23.	24.
hula hoop	2.81	24.	17.5
seesaw	2.83	25.	41.5
pogo stick	2.86	26.	20.
fire engine	2.96	27.	30.
drum	2.99	28.	34.
balloon	3.03	29.	31.
skates	3.12	30.	32.
bike	3.26	31.	50.
bicycle	3.27	32.	47.5
bat	3.34	33.	44.
truck	3.39	34.	28.
monopoly	3.44	35.5	39.
sandbox	3.44	35.5	49.
car	3.45	37.	45.
block	3.53	38.	6.
jacks	3.56	39.	15.
jump rope	3.58	40.	19.
sled	3.65	41.	40.
clay	3.67	42.	21.5
bow and arrow	3.68	43.	51.5
stilts	3.69	44.5	41.5
boat	3.69	44.5	38.
airplane	3.71	46.	46.
tractor	3.76	47.	47.5
baseball	3.78	48.	33.
wagon	3.88	49.	21.5
erector set	3.95	50.	17.5
gun	3.96	51.	57.

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Goodness-Of-Example Norm For The Category TOY

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
rope	4.23	52.	51.5
checkers	4.51	53.	43.
tennis racket	4.63	54.	59.
animals	4.66	55.	58.
cards	4.68	56.	54.
books	5.34	57.	60.
dishes	5.63	58.	53.
horse	5.69	59.	56.
mitt	6.12	60.	55.

Goodness-Of-Example Norm For The Category VEGETABLE.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
potato	1.21	1.	29.
cauliflower	1.24	2.	9.
carrot	1.28	3.	2.
brussels sprouts	1.32	4.	10.
pea	1.36	5.	1.
leek	1.52	6.	36.
onions	1.63	7.	26.
green beans	1.64	8.	3.
spring greens	1.72	9.5	31.
turnip	1.72	9.5	20.
greens	1.79	11.	16.
bean	1.80	12.	27.
broccoli	1.86	13.5	6.
string beans	1.86	13.5	4.
parsnip	2.04	15.	30.
spinach	2.08	16.	5.
lettuce	2.22	17.	12.
mushroom	2.30	18.	43.
greeen peppers	2.58	19.	23.5
celery	2.60	20.	13.
asparagus	2.67	21.	7.
peppers	2.73	22.	37.
cucumber	2.83	23.	14.
radishes	2.93	24.	25.
corn	2.99	25.	8.
artichokes	3.01	26.	19.
watercress	3.08	27.	34.
sweet potato	3.10	28.	38.
beets	3.13	29.	15.
green onion	3.40	30.	28.
parsely	3.80	31.	40.
blackeyed peas	3.84	32.	35.
tomato	3.87	33.	17.
kale	4.26	34.	46.
garlic	4.29	35.	53.
pumpkin	4.31	36.	51.
yams	4.40	37.	39.
baked beans	4.58	38.	50.
lima beans	4.78	39.	18.
eggplant	4.85	40.	21.
sauerkraut	4.89	41.	48.
rice	4.98	42.	56.
avacado	5.20	43.	44.
rhubarb	5.25	44.	45.
okra	5.34	45.	23.5
pickles	5.35	46.	49.
endive	5.58	47.	41.
seaweed	5.59	48.	52.
peanut	5.73	49.	55.

Cont/...

.../Cont.,
Goodness-Of-Example Norm For The Category VEGETABLE

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
squash	5.78	50.	11.
wax beans	5.86	51.	33.
escarole	5.98	52.	47.
collard	6.15	53.	32.
dandelion	6.19	54.	54.
rutabaga	6.43	55.	42.
romaine	6.45	56.	22.

Goodness-Of-Example Norm For The Category VEHICLE.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
car	1.11	1.	4.
bus	1.26	2.	5.5
automobile	1.29	3.	1.
van	1.46	4.	11.
motorcycle	1.50	5.	9.
taxi	1.67	6.	5.5
jeep	1.73	7.	7.
truck	1.80	8.	3.
bike	2.09	9.	19.
ambulance	2.11	10.	8.
bicycle	2.17	11.	16.
train	2.20	12.	14.
station wagon	2.52	13.	2.
honda	2.57	14.	12.
scooter	2.69	15.	23.
streetcar	2.73	16.	10.
airplane	2.75	17.	18.
tube	3.06	18.	26.
carriage	3.11	19.	17.
trolley (car)	3.23	20.	15.
jet	3.29	21.	21.
tricycle	3.36	22.	35.
tractor	3.41	23.	24.
wagon	3.47	24.	25.
cable car	3.59	25.	13.
ship	3.68	26.	22.
cart	3.72	27.	28.
go-cart	3.92	28.	32.
tank	3.93	29.	31.
boat	3.96	30.	20.
trailer	4.33	31.	27.
rowboat	4.85	32.	33.
yacht	4.61	33.	30.
rocket	4.83	34.	41.
canoe	4.89	35.5	36.
submarine	4.89	35.5	38.
wheelchair	4.97	37.	29.
raft	5.04	38.	37.
sled	5.09	39.	39.
dogsled	5.10	40.	34.
feet	5.18	41.	45.
horse	5.33	42.	40.
skates	5.39	43.	43.
elevator	5.42	44.	50.
skis	5.47	45.	46.
wheelbarrow	5.59	46.	48.
camel	5.71	47.	44.
skateboard	5.82	48.	47.
surfboard	5.92	49.	49.
blimp	6.21	50.	42.

Goodness-Of-example Norm For The Category WEAPON.

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
gun	1.26	1.	1.
revolver	1.29	2.	3.
pistol	1.33	3.	2.
shotgun	1.37	4.	9.
machine gun	1.38	5.	4.
dagger	1.52	6.	8.
knife	1.53	7.	7.
rifle	1.55	8.	5.
sword	1.56	9.	10.
bomb	1.60	10.	11.5
hand grenade	1.69	11.	11.5
A-bomb	1.80	12.	13.5
bayonet	1.82	13.	13.5
spear	1.89	14.	15.
missile	2.15	15.	29.
axe	2.17	16.	35.
cannon	2.37	17.	17.
arrow	2.42	18.	25.
tomahawk	2.59	19.	23.
bow and arrow	2.61	20.5	18.
switchblade	2.61	20.5	6.
tank	2.65	22.	27.
lance	2.69	23.	20.
brass knuckles	2.71	24.	21.
hatchet	2.73	25.	32.
bullet	2.75	26.	22.
club	2.76	27.5	19.
razor	2.76	27.5	37.
bazooka	2.93	29.	16.
whip	2.95	30.	30.
teargas	3.16	31.	28.
bow	3.30	32.	36.
fists	3.43	33.	34.
mortar	3.56	34.5	25.
razor blade	3.56	34.5	38.
poison	3.74	36.	42.
gas	3.96	37.	45.
hammer	4.01	38.	50.
rocket	4.09	39.	39.
slingshot	4.10	40.	33.
chain	4.14	41.	46.
scissors	4.28	42.	47.
stone	4.29	43.	44.
pitchfork	4.31	44.	49.
stick	4.34	45.	41.
ice pick	4.36	46.	31.
rock	4.80	47.	43.
rope	4.88	48.	54.
words	4.93	49.	51.
truncheon	4.86	50.	26.
bricks	5.05	51.	48.
judo	5.07	52.	40.

Cont/...

.../Cont.,
Goodness-Of-example Norm For The Category WEAPON

	Mean Rating	Rank (U.K.)	Rank (U.S.A.)
glass	5.11	53.	59.
hand	5.17	54.	52.
car	5.36	55.	57.
screwdriver	5.40	56.	58.
pipe	5.48	57.	53.
airplane	5.56	58.	55.
foot	5.73	59.	56.
shoes	6.35	60.	60.

Table A.2

This table contains the imagery ratings gathered in experiment 2, chapter 7. Exemplars are listed under their category headings and next to each exemplar is the following information: Typicality rating; mean ratings for ease and detail of imagibility for typical instance imagers; mean ratings for ease and detail of imagibility for personal instance imagers; overall means for rated imagibility [collapsed across ease and detail] of typical and personal images.

Table A.2 Personal and Typical Instance Imagery Ratings.
[E=Ease, D=Detail, TI=Typical Instance, PI=Personal Instance]

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	WEAPON						
1.26	gun	1.389	2.870	2.218	3.691	2.129	2.955
1.38	dagger	1.648	2.648	3.545	4.073	2.480	3.309
1.52	machinegun	1.976	2.389	2.928	3.401	2.433	2.988
2.76	razor	1.301	2.013	2.143	2.528	1.962	2.340
2.95	whip	1.944	2.944	3.073	3.318	2.444	2.964
3.30	bow	1.370	2.296	1.273	3.127	1.833	2.200
3.80	rocket	2.133	3.486	3.343	4.429	2.809	3.885
3.86	slingshot	3.963	4.981	5.127	5.927	4.472	5.527
4.86	truncheon	4.944	5.426	5.000	5.727	5.185	5.363

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	BIRD						
1.11	robin	1.185	1.648	1.836	2.236	1.416	2.036
1.14	blackbird	1.296	1.926	2.136	2.645	1.611	2.390
1.16	sparrow	1.426	2.463	2.636	4.145	1.944	3.390
2.90	peacock	1.611	2.315	2.345	3.400	1.963	2.872
2.98	parrot	1.759	2.815	3.018	4.109	2.287	3.563
3.02	duck	1.481	2.333	2.018	3.364	1.907	2.691
3.87	turkey	1.312	2.125	1.825	2.891	2.116	2.408
4.11	ostrich	2.574	3.574	2.837	3.727	3.074	3.282
4.17	penguin	1.636	2.722	2.655	3.891	2.179	3.273

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	VEGETABLE						
1.21	potato	1.148	1.593	2.127	3.164	1.371	2.645
1.24	cauliflower	1.296	1.648	2.891	4.200	1.472	3.455
1.28	carrot	1.111	1.315	1.989	3.127	1.213	2.558
2.83	cucumber	1.423	1.898	1.524	1.481	1.960	3.059
2.99	corn	1.741	2.333	2.800	3.691	2.037	3.246
3.08	watercress	1.815	2.407	2.491	4.582	2.111	3.536
4.98	rice	1.519	2.000	2.345	3.127	1.759	2.736
5.59	seaweed	1.833	2.759	2.200	3.270	2.296	2.735
5.73	peanut	1.204	1.796	1.982	3.036	1.500	2.509

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	CLOTHING						
1.24	jacket	1.481	2.000	1.818	2.745	1.740	2.281
1.25	shirt	1.259	1.722	2.182	2.127	1.490	2.154
1.27	sweater	1.426	2.093	2.600	3.091	1.759	2.845
2.87	payjamas	1.500	2.222	2.064	2.926	1.861	2.500
3.25	nylons	1.463	2.000	2.436	3.436	1.731	2.964
3.30	bathrobe	1.667	2.204	2.600	3.340	1.935	2.970
6.06	hairband	1.759	2.519	2.600	3.473	2.139	3.036
6.47	purse	1.519	2.074	2.327	3.055	1.796	2.691
6.65	cane	2.019	2.611	2.964	4.309	2.315	3.636

Cont/...

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Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	FRUIT						
1.15	apple	1.148	1.481	1.818	3.073	1.314	2.445
1.26	strawberry	1.315	1.667	1.982	2.855	1.491	2.418
1.30	pear	1.148	1.852	2.282	3.536	1.500	2.909
3.41	berry	1.907	2.667	2.746	3.891	2.287	3.318
3.79	avacado	1.796	2.556	2.800	3.400	2.176	3.100
3.84	prunes	1.685	2.278	3.036	4.145	1.981	3.590
5.57	olive	2.778	3.500	3.055	4.000	3.139	3.527
5.70	nut	1.667	2.407	2.782	3.782	2.037	3.282
6.64	pickle	2.000	2.901	2.418	3.491	2.450	2.954

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	TOY						
1.27	teddybear	1.222	1.648	1.982	2.636	1.435	2.309
1.44	doll	1.333	1.870	2.400	3.345	1.601	2.872
1.56	toysoldier	1.759	2.630	3.127	4.309	2.194	3.718
2.83	seesaw	1.871	2.130	2.213	2.425	2.000	2.719
3.03	balloon	1.222	1.741	2.327	3.218	1.481	2.772
3.12	skates	1.574	2.537	2.400	3.091	2.055	2.745
3.69	stilts	1.630	2.611	2.700	3.355	2.120	3.027
4.51	checkers	3.142	4.569	4.684	5.314	3.855	4.999
4.68	cards	1.407	2.296	2.036	2.691	1.851	2.363

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	VEHICLE						
1.11	car	1.259	1.926	1.273	1.909	1.592	1.591
1.26	bus	1.185	1.889	1.782	3.145	1.537	2.463
1.46	van	1.537	2.352	2.418	3.127	1.944	2.772
3.29	jet	1.883	3.093	2.091	3.091	2.488	2.591
3.47	wagon	2.352	3.407	3.237	4.618	2.879	3.927
3.68	ship	1.463	2.630	2.145	3.164	2.046	2.654
5.42	elevator	2.000	2.889	2.400	3.236	2.443	2.818
5.47	skiis	1.889	3.093	3.164	4.455	2.491	3.809
5.92	surfboard	1.685	2.852	2.600	3.613	2.268	3.106

Typic- -ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	SPORT						
1.29	tennis	1.944	2.704	2.036	2.891	2.324	2.463
1.35	rugby	2.204	3.352	2.582	3.891	2.778	3.236
1.70	cricket	1.759	2.630	2.200	3.345	2.194	2.772
3.03	judo	2.353	3.648	3.091	4.382	3.000	3.736
3.13	archery	2.389	2.944	2.673	3.927	2.666	3.300
3.18	sailing	1.926	2.907	2.236	3.200	2.416	2.718
5.52	chess	1.852	2.778	2.309	3.509	2.315	2.909
5.81	camping	2.093	2.926	2.000	2.618	2.509	2.309
6.92	sunbathing	1.796	2.556	1.764	2.400	2.176	2.082

/Cont...

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Typic--ality Rating	Category	E-TI	D-TI	E-PI	D-PI	TI MEAN	PI MEAN
	FURNITURE						
1.23	table	1.781	1.932	1.981	2.853	1.856	2.417
1.28	chair	1.244	1.583	1.161	2.791	1.413	1.976
1.29	bed	1.916	2.001	1.636	1.964	1.958	1.800
4.30	lamp	2.093	2.187	2.532	3.000	2.140	2.766
4.48	mirror	2.168	2.982	2.745	3.635	2.575	3.190
4.49	rug	2.837	3.103	2.936	3.375	2.970	3.155
5.33	radio	2.000	2.610	2.819	3.402	2.305	3.110
5.70	telephone	1.872	2.106	1.914	3.600	1.989	2.757
6.01	ashtray	2.301	2.982	3.855	4.328	2.641	4.141

APPENDIX B

This appendix contains the stimuli employed in experiment 3 and 12 examples of Ss PI and TI image descritpions, 6 from the PI condition followed by the corresponding 6 from TI.

Stimuli employed in experiment 3:

Category	Category	Category
Furniture	Fruit	Clothing
-----------------	Most Typical Exemplars	-----------------
Table	Apple	Jacket
Chair	Orange	Shirt
Bed	Strawberry	Sweater
Couch	Peach	Skirt
Desk	Pear	Suit
-----------------	Least Typical Exemplars	-----------------
Vase	Tomato	Handkerchief
Radio	Coconut	Watch
Telephone	Olive	Hairband
Ashtray	Nut	Ring
Pillow	Pickle	Purse

Examples of Ss PI and TI image descriptions:

Personal Instance Imagers

S2: Desk: "Old metal desk we used to keep in garage at my parent's house. It was a bit rusty".

S11: Furniture: "Stewkly Manor--full of second-hand furniture chairs, tables, sofas, all piled on top of each other in main room".

S6: Apple: "Very red apple sitting on top of other fruit in bowl on kitchen table at home".

S8: Watch: "Watch I bought on plane comming back from Italy, it's got a blue face and I'm wearing it now".

S1: Sweater: "Chunky grey sweater that I bought from shop in London on Kensington High Street. It's very warm.

S9: Fruit: "I have an image of this really gaudy ornament that a neibour of mine has in her hallway. Its a very brighlty painted bowl full of china fruit on a wooden pedistal. Ugh !".

Typical Instance Imagers

S12: Desk: "A wooden pine desk with flat top, draws down one side, four legs, handles on draws".

S6: Furniture: "I've an image of all sorts of furntiture Soft, Leather, wooden, metal, glass, fabrics, large, small, chairs, tables, beds, couches, wardrobes..."

S7: Apple: "Red and round with a brown coloured stalk"

S1: Watch: "Metal, leather strap, hands, dial, numbers round dial, glass covering the face".

S9: Sweater: "Ribbed, cream coloured, arms, roll neck, long, made of wool."

S4: Fruit: "Apples, oranges, peaches, banannas, smell very sweet, multicoloured, reds, yellows, and greens, different shapes, round, spherical, long".

APPENDIX C

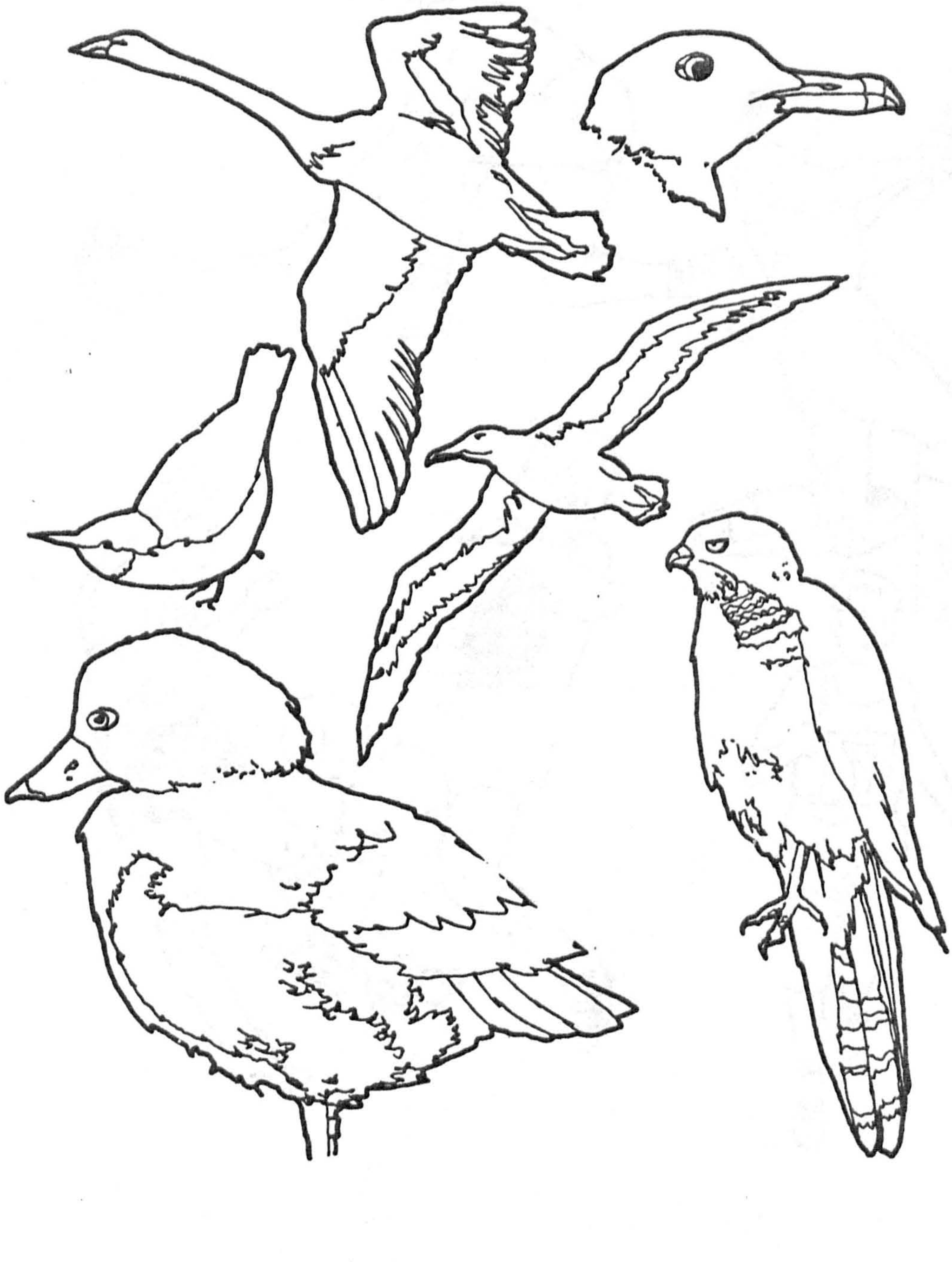
This appendix contains the stimuli employed in experiment 4 and an example of the picture prime stimuli.

Category Furniture	Category Vehicle	Category Toy	Category Fruit
Highly Typical Exemplars			
Table Bed	Car Bus	Teddy bear Doll	Apple Pear
Mediumly Typical Exemplars			
Mirror Rug	Wagon Ship	Balloon Skates	Berry Prunes
ATypical Exemplars			
Telephone Ashtray	Skiis Surboard	Stilts Cards	Olive Pickle

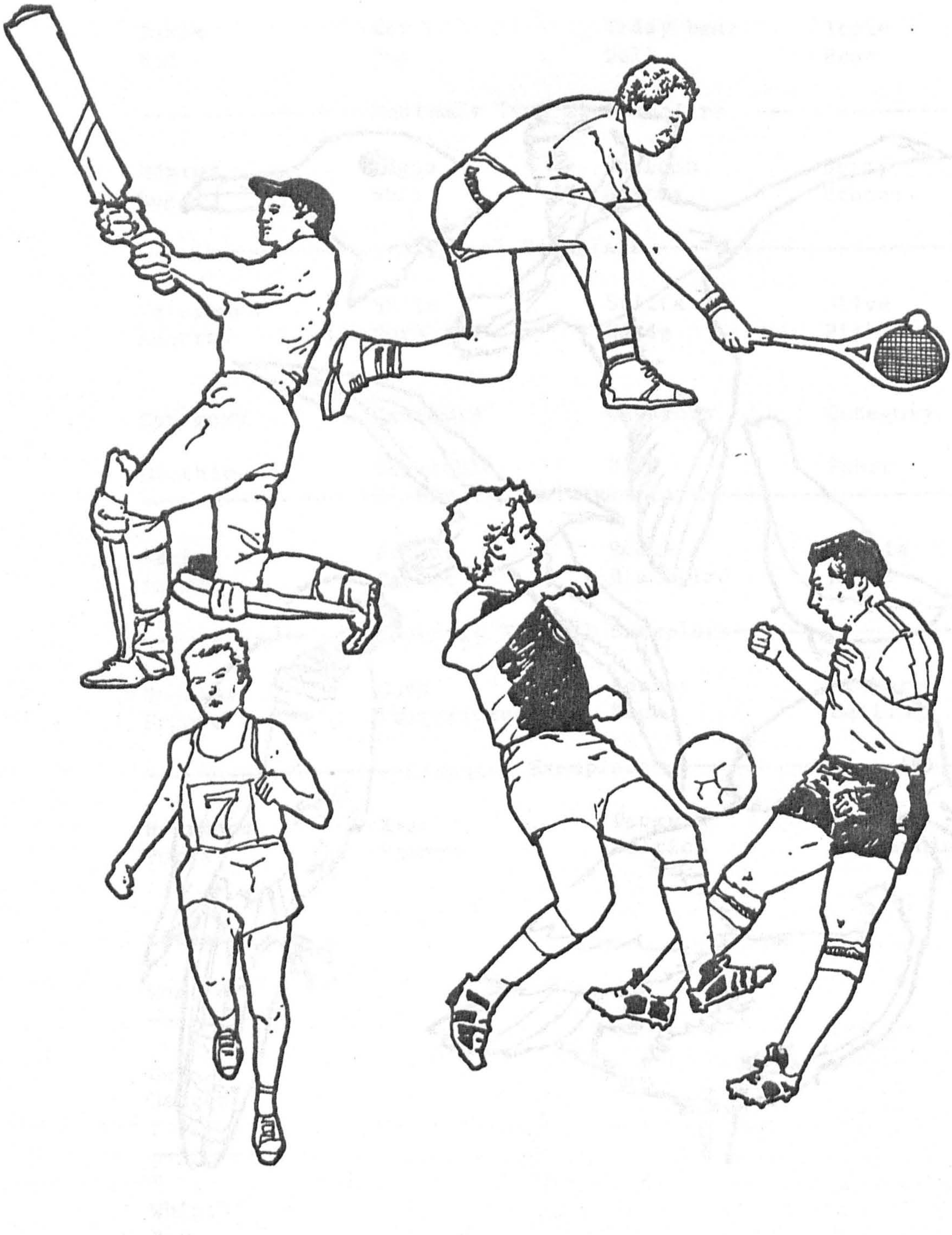
Category Clothing	Category Vegetable	Category Bird	Category Sport
Highly Typical Exemplars			
Jacket Shirt	Potato Carrot	Robin Blackbird	Tennis Rugby
Mediumly Typical Exemplars			
Pyjamas Nylons	Corn [water]Cress	Parrot Duck	Archery Sailing
ATypical Exemplars			
Hairband Purse	Rice Peanut	Penguin Ostrich	Chess Sunbathing

Category Weapon
Gun Dagger
Whip Bow
Slingshot Truncheon

Example of Picture Prime: BIRD



Example of Picture Prime: SPORT



APPENDIX D

This appendix contains the locative attribute and perceptual attribute norms [in that order] reported in experiment 6, chapter 10. The norms for each category are distributed over 3 pages, the first page contains the the norm for the category superordinate, the second and third pages contain the norms for the exemplars ordered from most typical to least typical. The category norms are grouped in the order Weapon, Bird, Vegetable, Clothing, Fruit, Toy, Vehicle, Sport, Furniture. Each page contains the following information on successive lines: The word responded to; the rated typicality of the word, Typ; the mean number of responses per subject, X; internal reliability correlations for the frequency of response measure, r; followed by the actual attribute responses listed in order of decreasing production frequency; each response is accompanied by the absolute frequency measure A, expressed as a percentage. Responses generated by only one subject are not presented.

Locational Attribute Norms For Items Of Varying Typicality From Nine Semantic Categories

WEAPON

[N=40]*
X=5.1 r=.82

army	52.5
museum	30
armoury	27.5
T.V.	20
war	20
battle	15
soldier	15
riots	15
fight	12.5
gunsmiths	12.5
hand	7.5
holster	7.5
gunroom	7.5
belt	7.5
films	7.5
castle	5
police	5
thugs	5
terrorists	5
history books	5
torturers	5

* N=40 for all norms.

GUN	A%
Typ=1.26	
X=6.3 r=.71	
holster	55
armoury	37.5
gunsmith	35
hunting	25
shop	25
army	22.5
sports shop	20
war	17.5
U.S. policeman	17.5
U.S.A.	15
soldier	15
gamekeeper	12.5
arsenal	12.5
range	10
pigeon shooting	10
museum	10
policeman	10
western	7.5
cowboy	7.5
cowboy film	7.5
T.V.	7.5
film	7.5
battle	7.5
gangster	5
dealer	5
poacher	5
farmer	5
field	5
court exhibit	5
hand	5
at a shooting	5

DAGGER	A%
Typ=1.52	
X=6.4 r=.71	
sheath	57.5
belt	30
museum	27.5
hand	22.5
play	20
film	17.5
shop	17.5
scabbard	15
crimes	15
back	12.5
'whodunnit'	12.5
hanging on wall	10
soldier	10
fight	10
knight	7.5
thug	7.5
corpse	5
indian	5
desk paperknife	5
macbeth	5
Scotsman's sock	5

WHIP	A%
Typ=2.95	
X=6.6 r=.68	
circus	57.5
huntsman	32.5
horses	27.5
lion tamers	22.5
sex shop	20.5
riding	17.5
jockeys	17.5
animal trainer	15
ringmaster	15
riding school	15
horse trainers	12.5
horse trials	12.5
horse races	12.5
horse shows	10
stables	10
torture chamber	10
slave ship	10
carriage	10
farm	7.5
saddlers	7.5
show jumping	7.5
chariot race	7.5
stage coach	5
bordello	5
brothel	5
on pub wall	5
Houses of- -Parliament	5

BOW	A%	SLINGSHOT	A%	TRUNCHEON	A%
Typ=3.30 X=4.3 r=.51		Typ=4.20 X=4.1 r=.75		Typ=4.86 X=6.3 r=.58	
archer	47.5	battles	32.5	policeman	87.5
Robin Hood	35	Bible	32.5	riots	52.5
with arrows	27.5	David & Goliath	25	police station	47.5
archery club	22.5	castles	25	policeman's hand	22.5
sports shop	17.5	in a boy's pocket		demonstrations	20
Agincourt	15	a catapult	25	football grounds	17.5
battlefield	15	museums	17.5	T.V.	15
film	15	sports shop	17.5	in a museum	12.5
Sherwood Forest	10	knights	12.5	rubber	12.5
country	10	war	12.5	violence	10
hunt	5	fight	12.5	burglaries	10
target	5	army	10	a bouncer in-	
toy shop	5	primitive tribes	10	-a club	7.5
war	5	historical times	10	up a person's-	
medieval times	5	excavations	7.5	-sleeve	7.5
William Tell	5	encyclopedia	5	mugger's hand	5
		hunting	5	hand	5
		film	5	in police film	5
		leather	5	Panda car	5
		stones	5	straps	5

BIRD

X=7.4 r=.83

sky	77.5
tree	70
garden	67.5
zoo	50
cage	47.5
bushes	30
field	27.5
nest	22.5
T.V.	22.5
aviary	20
hedges	15
fence	15
museum	12.5
park	12.5
roof	10
telephone wire	7.5
water	7.5
butcher's	5
fence	5
pigeon loft	5
bird bath	5

ROBIN

Typ=1.11
X=8.2 r=.84

ROBIN	A%
garden	87.5
tree	82.5
Christmas card	52.5
bushes	30
nest	30
fence	22.5
hedge	22.5
lawn	17.5
fields	17.5
book	15
T.V. documentary	12.5
village green	10
birdtable	10
woods	5
roof	5
balcony	5
birdbath	5
teapot	5
starch packet	5

BLACKBIRD

Typ=1.14
X=5.4 r=.53

BLACKBIRD	A%
garden	60
pie	40
trees	27.5
nest	27.5
fence	25
hedge	25
field	25
bush	20
lawn	17.5
countryside	17.5
in the air	15
nursery rhymes	15
T.V. documentary	10
park	7.5
table	7.5
yard	7.5
roof	5
post	5
birdbath	5
on the ground	5
bird book	5

PARROT

Typ=2.98
X=8.2 r=.73

PARROT	A%
cage	100
zoo	72.5
pet shop	50
perch	30
jungle	27.5
aviary	25
Long John Silver's- -shoulder	25
Monty Python- -sketch	20
South America	20
Africa	17.5
sholder	15
in a museum	15
pantomime	12.5
forest	10
trees	10
tropics	7.5
circus	7.5
house	7.5
bird book	5
T.V.	5
Simpson	5
film	5

DUCK	A%	PENGUIN	A%	OSTRICH	A%
Typ=3.02		Typ=4.17		Typ=4.11	
X=8.9 r=.78		X=5.4 r=.56		X=6.1 r=.73	
pond	85	antartic/artic	92.5	zoo	72.5
lake	65	zoo	77.5	Africa	50
river	52.5	T.V.	25	T.V.	32.5
zoo	47.5	on a biscuit- -wrapper	22.5	wildlife park	25
restaurant	32.5	icy cold water	17.5	desert	20
on a plate	30	book cover	17.5	museum	17.5
farmyards	27.5	in a museum- -stuffed	15	hot & dry- -countries	15
park	27.5	wildlife park	15	Australia	12.5
supermarket	22.5	frozen wastes	12.5	plains	12.5
butcher's	20	icebergs	12.5	on the ground	10
stream	17.5	North Pole	12.5	bird book	7.5
marshes	17.5	glaciers	10	sand	7.5
water	17.5	snow	7.5	wilderness	7.5
fairground	12.5	game park	7.5	scrubland	5
Aylesbury	10	pool	5	Kenya	5
meal	10	sea	5	encyclopedia	5
oven	7.5	bird book	5	pictures	5
estuary	7.5	tundra	5	display case	5
Thames	7.5	circus	5	with Rod Hull	5
pool	5	waddling	5		
cannal	5	encyclopedia	5		
fen	5	dress suit	5		
flying	5				
sky	5				
wall	5				
nest	5				
museum	5				
in a cartoon	5				

VEGETABLE

X=7.6 r=.87

garden	62.5
greengrocers	52.5
kitchen	50
shops	50
restaurant	30
field	25
supermarket	22.5
plate	20
market	17.5
meals	15
farm	15
soil	12.5
ground	12.5
allotments	7.5
freezer	7.5
fridge	7.5
stews	7.5
pan	5
tin	5
plastic bags	5

POTATO	A%	CARROT	A%	CORN	A%
Typ=1.21		Typ=1.28		Typ=2.99	
X=9.1 r=.49		X=6.4 r=.48		X=5.9 r=.47	
greengrocers	77.5	greengrocer	55	fields	95
field	50	garden	52.5	tin	42.5
garden	30	tins	32.5	on the cob	35
kitchen	27.5	restaurant	30	shop	30
in ground/earth	25	field	30	kitchen	22.5
chip shop	25	plate	27.5	America	20
in a sack	17.5	supermarket	20	joke	17.5
shop	15	shop	17.5	countryside	12.5
supermarket	15	ground	15	farm	12.5
chips	15	kitchen	15	cereals	12.5
meal	12.5	meal	12.5	harvest	10
plate	12.5	salad	12.5	on a toe	10
dinner	12.5	allotment	12.5	granary	7.5
allotment	10	horses	10	barn	7.5
pan	10	pan	10	windmill	7.5
oven	10	fruitiers	7.5	mill	5
jacket	10	market	7.5	flour	5
Ireland	7.5	stews	7.5	supermarket	5
tin	7.5	casseroles	5	bakers	5
farm	5	fork	5	bread	5
cottage pie	5	mouth	5	packet	5
fruitiers	5	stew	5	resaurant	5
market	5	bag	5	greengrocers	5
garden centre	5	pub	5	pantry	5
in packets	5	fridge	5	fridge	5
vegetable rack	5	rabbits	5	Canada	5
fork	5	vegetable rack	5	T.V. commercial	5
mouth	5				
crisps	5				
bowl	5				

WATERCRESS	A%
Typ=3.08	
X=6.4 r=.67	
greengrocers	77.5
salad	50
water	47.5
in sandwiches	32.5
plate	25
boxes/cartons	22.5
kitchen	20
pond	17.5
mustard	17.5
soup	17.5
pots	15
shop	10
supermarket	10
salad bowl	10
restaurant	10
mustard	7.5
garden	7.5
fridge	7.5
farm	5
field	5
Rickmansworth	5
blotting paper	5
fork	5
mouth	5
garnish	5
ditches	5
bag	5
windowsills	5

RICE	A%
Typ=5.20	
X=5.9 r=.62	
paddy fields	80
Chinese- -restauraunt	37.5
curry	35
shops	35
Indian- -restaurant	32.5
plate	30
packet	22.5
China	20
restaurant	20
kitchen	17.5
pudding	17.5
supermarket	15
India	15
meal	12.5
wedding	12.5
jar	10
third world- -counties	10
bowl	10
dish	7.5
fork	7.5
cooking	7.5
mouth	5
in a wok	5
Orient	5
Asia	5
Japan	5
Ceylon	5

PEANUT	A%
Typ=5.73	
X=6.4 r=.67	
packets	55
shop	52.5
pub	50
tins	25
dish	22.5
shell	20
cinema	20
zoo	20
in butter	15
tree	12.5
plant	12.5
Africa	10
greengrocer's	10
supermarket	10
America	7.5
T.V.	7.5
party	7.5
underground	7.5
jar	7.5
cartons	7.5
bowl	7.5
hot climates	7.5
Cyprus	5
Near East	5
South America	5
children	5
cupboard	5
fields	5
bushes	5

CLOTHING

X=5.9 r=.85

[clothes] shop	77.5
wardrobe	62.5
person	57.5
clothes/washing--line	30
chest-of--drawers	27.5
drawers	25
bedroom	25
home/house	20
laundry	20
suitcase	17.5
cupboards	15
drawer	15
hooks in hall	7.5
clothes hanger	7.5
on chair	5
on floor	5
dressing room	5
trunk	5
clothes rack	5

JACKET	A%
Typ=1.24	
X=6.4 r=.58	
person	52.5
wardrobe	50
shop	47.5
hanger	22.5
tailor's	20
potatoes	17.5
hot water--cylinder	17.5
clothes shop	15
coat hook	15
back of a chair	15
bedroom	15
window display	12.5
part of a suit	12.5
men	12.5
dry cleaners	10
cloakroom	10
market	7.5
sale	7.5
changing room	7.5
dressing room	7.5
man's shop	5
on rail	5
hall stand	5
laundry	5
book	5
house	5

SHIRT	A%
Typ=1.25	
X=5.9 r=.91	
shop	75
on a person	50
clothes/washing--line	30
on men	22.5
chest-of--drawers	22.5
wardrobe	17.5
laundry	17.5
hanger	17.5
washing machine	15
boy	15
clothes shop	12.5
Oxfam shop	12.5
store	12.5
man's shop	10
market	10
tailor	7.5
window display	7.5
on a dummy	7.5
dressing room	7.5
cupboard	5
clothes horse	5
irioning board	5
women	5
house	5
bedroom	5
back	5

PYJAMAS	A%
Typ=2.87	
X=7.2 r=.38	
bed	72.5
person	47.5
shop	42.5
bedroom	30
clothing shop	27.5
clothes/washing--line	27.5
chest of drawers	17.5
drawer	17.5
under pillow	15
pyjama case	15
wardrobe	15
airing cupboard	12.5
cupboard	10
man	10
laundry	7.5
washing machine	5
Marks & Spencers	5
clothes horse	5
ironing board	5
lounging	5
parent's house	5
hospital	5
party	5
silk	5
stripes	5
children	5
slippers	5
fireside	5
schools	5
camping	5
dreesing up	5
Sherlock Holmes	5
whitehall farce	5
theatre	5

NYLONS	A%	HAIRBAND	A%	PURSE	A%
Typ=3.25 X=6.4 r=.89		Typ=6.06 X=5.8 r=.62		Typ=6.47 X=6.7 r=.83	
legs	82.5	head	50	handbag	97.5
shops	75	hair	47.5	pocket	72.5
washing line	32.5	shop	32.5	shop	47.5
in a bag/packet	30	hairdressers	30	hand	25
hosiery shop	20	dressing table	27.5	shoppingbag	20
women	17.5	bedroom	25	shopping	20
chest of drawers	17.5	school	17.5	bank	20
cupboard	12.5	tennis players	15	drawer	17.5
supermarket	12.5	woman	15	basket	15
laundry	12.5	girl	15	holdall	15
on suspenders	10	Alice	12.5	coat	12.5
T.V. commercial	10	children	12.5	shop window	12.5
in a photograph	10	kindergarden	12.5	shopping trolley	10
models	7.5	sports shop	12.5	supermarket	10
striptease show	7.5	sportswomen	10	resaurant	10
wife	5	Borg	10	till	10
clothes horse	5	wife	7.5	leather shop	7.5
magazine	5	girl's school	7.5	dressing table	7.5
bank robbers	5	rock singer	5	table	5
sex shop	5	pony tail	5	shelf	5
		bathroom	5	belt	5
		photograph	5	women	5
		old films	5	house	5

FRUIT

X=6.6 r=.91

tree	75
bowl	52.5
greengrocers	50
supermarket	42.5
bush/hedge	35
orchard	30
shops	27.5
garden	22.5
kitchen	20
market	17.5
pie	15
tins	15
baskets	7.5
fruitier	7.5
restaurant	7.5
dessert	5
yogurt	5
paper bag	5
box	5

APPLE

Typ=1.15
X=8.4 r=.59

APPLE	A%
tree	90
greengrocers	52.5
pies	47.5
orchard	37.5
in a bowl	35
shop	30
supermarket	30
cider	22.5
house	17.5
kitchen	17.5
dish	17.5
tin	17.5
fruitiers	15
William Tell	12.5
dinning room	12.5
plate	12.5
basket	10
box	10
pantry	10
vegetable rack	10
lunch-box	7.5
shop	7.5
market	7.5
restaurant	5
tarts	5
sauces	5
fruit cocktail	5
Sommerset	5
cupboard	5
tray	5
fridge	5
turnover	5
in sandwichbox	5
garden	5

PEAR

Typ=1.30
X=6.7 r=.74

PEAR	A%
tree	82.5
greengrocers	75
tins	50
orchard	32.5
supermarket	30
in a bowl	27.5
fruitiers	25
house	17.5
12 days of-christmas	17.5
christmas carol	17.5
restaurant	17.5
market	15
in syrup	15
Babycham	12.5
in a basket	12.5
garden	12.5
dessert	10
in fruit salad	10
sunny country	5
Kent	5
kitchen	5
wasps	5
tin branch	5

BERRY

Typ=3.41
X=6.1 r=.63

BERRY	A%
bush	80
hedgerow/hedge	47.5
garden	32.5
pie	25
greengrocer's	22.5
tree	17.5
shrubs	17.5
holly	15
country	15
Christmas-decorations	15
fruitiers	12.5
shop	10
cans	10
jam	7.5
jelly	7.5
kitchen	7.5
jungle	7.5
branch	5
woods	5
field	5
pudding	5
wreath	5
frozen in-a packet	5
tin	5

PRUNES	A%
Typ=3.84	
X=5.6 r=.85	
tins	67.5
supermarkets	47.5
school dinners	32.5
grocer's	25
kitchen	22.5
custard	22.5
tree	17.5
pudding	17.5
dishes	17.5
dessert	17.5
canteen food	15
packet	15
bowl	15
dish	15
shop	12.5
pie	10
can	10
cupboard	7.5
spoon	5
breakfast	5
fruitiers	5
mouth	5
rice	5

OLIVE	A%
Typ=5.57	
X=7.4 r=.46	
tree	50
jar	47.5
Italy	45
Greece	45
restaurant	32.5
parties	30
oil	30
cocktails	27.5
bar	25
groves	22.5
supermarket	20
Spain	20
pizza	17.5
on top of meal	15
warm countries	12.5
Mediterranean	12.5
Greek restaurant	10
Corfu	7.5
Middle East	7.5
Turkey	7.5
Israel	7.5
France	7.5
shop	7.5
market	5
grocer	5
delicattessence	5
shop	5
gnarled trees	5
kitchen	5
dish	5
in a bowl	5
fridge	5
nets	5
packets	5

PICKLE	A%
Typ=6.64	
X=5.5 r=.43	
jars	77.5
supermarket	30
shops	27.5
pub	27.5
on a table	22.5
on a plate	20
pantries	17.5
grocer's	17.5
christmas	15
Indian- -restaurant	15
kitchen	12.5
meal	12.5
in a sandwich	12.5
fish & chip shop	10
dish	10
restaurant	7.5
cupboard	7.5
curries	7.5
sideboard	5
salad	5
fork	5
spoon	5
cheese	5
bar	5

TOY	A%
X=5.7 r=.52	
shops	60
playroom	47.5
child's room	40
toy shop	27.5
bedroom	22.5
houses	22.5
toy box	17.5
children	15
school	15
nursery	15
cupboard	12.5
fairground	10
playgroup	10
pram	5
garden	5
park	5
seaside	5
street	5
attic	5

TEDDYBEAR	A%
Typ=1.27	
X=6.9 r=.71	
bed	60
toy shop	47.5
bedroom	35
playroom	27.5
toy box	22.5
nursery	20
storybook	20
shop	17.5
with a child	15
toy cupboard	15
school	12.5
fairground	12.5
Brideshead--Revisited	12.5
pram	10
picnic	10
T.V.	7.5
playpen	7.5
playground	7.5
push chair	5
doll's house	5
carrycot's	5
kindergarden	5
story	5
Winnie-the-Pooh	5
in an advert	5

DOLL	A%
Typ=1.44	
X=5.7 r=.73	
pram	60
shop	45
doll's house	37.5
toy shop	32.5
playroom	27.5
bedroom	25
child's room	20
toy box	20
children	15
toy cupboard	15
doll's hospital	12.5
nursery	12.5
car window	12.5
playpen	10
playground	7.5
bed	7.5
pushchair	7.5
supermarket	5
girls	5
highchair	5
T.V.	5
magazines	5

BALLOON	A%
Typ=3.03	
X=6.4 r=.84	
party	72.5
sky	52.5
fairground	30
shop	22.5
children	22.5
in cartoons	17.5
christmas--decorations	17.5
basket	15
flying	15
circus	15
in the air	10
string	10
as a weather--station	10
toy shop	7.5
dance	5
war	5
air show	5
France	5
market	5

SKATES	A%
Typ=3.12	
X=7.1 r=.43	
ice rink	70
roller skating-rink	42.5
lakes	40
sports shop	35
pond	30
skating rink	27.5
fish shop	22.5
ice	17.5
toy shop	17.5
Wolverton	15
toy cupboard	15
lake	15
Richmond	12.5
Olympics	12.5
dancing	10
river	7.5
canal	7.5
on the road	5
children	5
feet	5
boots	5
T.V.	5
liesure centre	5
empty car park	5
open spaces	5
pavements	5
pictures	5

STILTS	A%
Typ=3.69	
X=5.4 r=.49	
circus	82.5
playground	32.5
houses in-wet countries	30
clowns	25
toy shop	22.5
legs	17.5
fair	17.5
theatre	15
pantomime	15
Jeux Sauns-Frontiers	15
children	12.5
toy cupboard	10
playroom	7.5
garage	5
school	5
streets	5
water	5
Holland	5
jungle	5
swamps	5

CARDS	A%
Typ=4.68	
X=6.3 r=.67	
shops	50
casino's	47.5
home	35
club	30
pub	25
packs	25
bridge club	22.5
whist drive	20
games shop	17.5
office	17.5
lounge	15
fortune telling	15
decks	12.5
drawer	12.5
sleeve	12.5
supermarkets	7.5
newsagents	7.5
common room	5
toy box	5
cupboard	5
table	5
sale rep.	5
index cabinet	5

VEHICLE

X=7.1 r=.89

garage	75
road	75
carpark	62.5
motorway	25
street	22.5
town	17.5
railway	15
driveway	15
show/sales room	15
petrol station	12.5
runway	12.5
aiport	12.5
station	10
terminus	10
shop	5
shed	5
countryside	5

CAR	A%
Typ=1.11	
X=8.6 r=.86	
garage	85
road	82.5
car park	75
street	47.5
drive[way]	35
petrol station	22.5
show room	20
motorway	17.5
traffic jam	15
railway	15
T.V./fim	12.5
car port	12.5
town	12.5
city	10
sales room	10
lay-by	10
side of road	7.5
lanes	7.5
car ferry	7.5
motorshow	7.5
forecourt	5
roundabout	5
Le Mans	5
Watkins Glen	5
factory	5

BUS	A%
Typ=1.26	
X=6.1 r=.72	
road	75
station	62.5
streets	52.5
town	50
stop	47.5
city	22.5
depot	20
terminus[al]	20
campus	20
villages	17.5
London	17.5
in a bus lane	15
traffic jam	15
coach park	10
garage	7.5
route	7.5
motorway	5
sea-front	5
country	5
airport	5
museum	5

WAGON	A%
Typ=3.47	
X=5.6 r=.54	
cowboy films- -western	52.5
railway	50
farm	27.5
road	25
wild west	20
trains	17.5
goods yard	15
cowboys &- -indians	15
lanes	12.5
toy	12.5
prairie	10
fair	10
trails	7.5
train set	7.5
shunting yards	7.5
transport depot	7.5
sidings	7.5
market	5
gypsies	5
brewery	5
fairgrounds	5
T.V.	5
car park	5
museum	5

SHIP	A%
Typ=3.68	
X=7.5 r=.54	
sea	97.5
dock	75
harbour	47.5
ocean	22.5
lake	22.5
river	20
port	20
cannal	17.5
Channel	17.5
estuary	15
dry dock	15
pictures	15
marina	10
Pacific	7.5
Atlantic	7.5
India	7.5
berth	5
jetty	5
wreck	5
films	5
T.V.	5
advertisments	5
ferry brochure	5
model in museum	5
war	5
Islands	5

SKIIS	A%
Typ=5.47	
X=5.2 r=.51	
snow	52.5
Switzerland	50
mountains	37.5
snowy slopes	35
sports shop	30
Alps	30
Austria	30
on roofracks	22.5
ski-slopes	20
T.V.	17.5
adverts	17.5
ice	15
cold climates	15
hills	12.5
Europe	12.5
St. Moritz	12.5
Scotland	12.5
Tyrol	10
France	10
Spain	7.5
Italy	7.5
Sweden	7.5
Norway	5
Finland	5
Scandinavia	5
shop	5
on water	5
Olympics	5
sea planes	5

SURFBOARD	A%
Typ=5.92	
X=5.9 r=.67	
beach	77.5
sea	52.5
California	50
Austrailia	47.5
sea-side	25
sports shop	22.5
on top of car	20
Hawaii	17.5
Cornwall	17.5
water	15
T.V.	12.5
shop	12.5
America/U.S.A.	12.5
South American--beaches	10
Bondi Beach	10
Devon	10
ocean	7.5
sea shores	7.5
holiday	5
lake	5
waves	5
surf	5
films	5

SPORT

X=5.5 r=.74

playing field	72.5
T.V.	50
stadium	27.5
liesure centre	25
football ground	17.5
pitch	17.5
swimming-pool	15
sports hall	15
O.U.	12.5
gymnasium	12.5
tennis courts	10
racing tracks	7.5
club	7.5
hall	5
sea	5
board	5
snooker table	5

TENNIS	A%
Typ=1.29	
X=6.1 r=.87	
courts	85
Wimbeldon	75
television	47.5
grass	22.5
school	22.5
indoor	20
sports club	17.5
leisure centre	15
parks	10
tennis club	10
tournament	10
Forest Hills	7.5
Sweden	7.5
U.S.A.	7.5
outdoor	5
O.U.	5
table	5
at the seaside	5
Roehampton	5

RUGBY	A%
Typ=1.35	
X=7.2 r=.63	
field	52.5
Twickenham	50
pitch	32.5
town	30
Murrayfield	25
rugby ground	25
T.V.	17.5
school	17.5
Cardif Arms--Park	15
Wales	15
France	12.5
rugby club	10
in mud	10
Landsdowne Road	7.5
Cardiff	7.5
Warickshire	7.5
England	7.5
The Oval	5
Huddersfield	5
stadium	5
park	5
on grass	5

ARCHERY	A%
Typ=3.13	
X=4.9 r=.56	
field/meadow	77.5
Sherwood Forest	37.5
sports centre	32.5
Olympic Games	17.5
T.V.	17.5
woods	17.5
outdoors	15
sports club	15
Robin Hood	12.5
club	12.5
range	7.5
country	5
lawn	5
archery club	5
gym	5
Medieval films	5
fair	5

SAILING	A%	CHESS	A%	SUNBATHING	A%
Typ=3.18		Typ=5.52		Typ=6.92	
X=6.2 r=.58		X=3.8 r=.47		X=6.9 r=.59	
lake	87.5	board	45	beach	97.5
sea	85	T.V.	42.5	garden	60
river	75	tournament	40	swimming pool	32.5
ocean	22.5	Russia	35	seaside	30
loch	20	games shop	27.5	holidays	27.5
canal	17.5	club	20	solarium	25
reservoir	15	home	15	abroad	17.5
broads	15	World-		field	15
Mediterranean	15	-Championship	15	terrace	12.5
pond	12.5	sitting room	10	lawn	12.5
Greece	10	newspaper	10	garden chair	12.5
estuary	10	games room	7.5	roof	12.5
bath	7.5	U.S.A.	7.5	sun bed	10
water	5	computer	7.5	sun lounge	10
harbour	5	competitions	5	outdoors	7.5
seaside	5	contest	5	sauna	7.5
Atlantic	5	toy shop	5	boat	5
Cowes	5	toy box	5	patio	5
yatch club	5	cupboard	5	South of France	5
boatshow	5	school	5	Riviera	5
films	5	lounge	5	Italy	5
T.V.	5	hotel lounge	5	Marjorca	5
				Spain	5
				California	5
				West Indies	5
				hot climates	5
				dunes	5

FURNITURE	A%
X=5.9 r=.85	
house	77.5
office	72.5
shop	70
rooms	27.5
department store	20
furniture shop	17.5
warehouse	15
removal van	15
work place	12.5
restaurant	10
factory	10
home	10
auction	7.5
Habitat	5
cafe	5
John Lewis	5
kitchen	5

TABLE	A%
Typ=1.23	
X=6.2 r=.87	
office	60
dinning room	57.5
room	50
house/home	57.5
kitchen	42.5
shop	25
pub	20
restaurant	17.5
hotel	15
lounge	15
classroom	12.5
meeting rooms	12.5
garden	10
on a picnic	10
furniture shop	10
warehouse	7.5
here	7.5
sitting room	7.5
board room	5
cafe	5
bar	5
entrance hall	5
shed	5

BED	A%
Typ=1.29	
X=5.9 r=.73	
bedroom	70
hospital	52.5
shop	52.5
house/home	47.5
garden	30
hotel	22.5
bed sit	20
airbed on beach	15
furniture shop	15
dormitory	15
flat	12.5
warehouse	10
store	10
room	7.5
hostel	7.5
old people's- -hom	7.5
caravan	5
children's home	5
sunbed	5
camping	5
park	5
sickroom	5

MIRROR	A%
Typ=4.48	
X=6.7 r=.69	
bathroom	77.5
hall	50
bedroom	47.5
wall	30
toilets/loos	30
dressing table	27.5
dress/clothes- -shop	27.5
handbag	20
hall of mirrors	17.5
car	15
make-up bag	12.5
hairdressers	12.5
kitchen	12.5
dreessing room	10
cabinet	10
tailors	7.5
shop	7.5
restaurant	7.5
opticians	5
microscope	5
telescope	5
house	5
newspaper	5
Alice Through The- -Looking-Glass	5

RUG

Typ=4.49
X=6.3 r=.67

RUG	A%
fireside/hearth	60
floor	57.5
living room- -lounge	50
house/home	32.5
shops	30
bedroom	22.5
carpet shop	20
room	17.5
walls	17.5
entrances	15
corridor	15
car	15
kit	10
bedside	10
bathroom	10
rug shop	7.5
handicraft shop	7.5
doorways	7.5
lobby	5
room	5
house	5
office	5
Persia	5
beach	5

TELEPHONE

Typ=5.69
X=7.4 r=.79

TELEPHONE	A%
office	80
box	52.5
house/home	50
table	45
kiosk	45
wall	42.5
desk	30
booth	27.5
exchange	20
hotel	17.5
restaurant	17.5
hall	15
pub	15
station	15
street	12.5
work	12.5
study	10
Rolls Royce	5
car	5
police station	5
films	5
airport	5
bank	5
meeting rooms	5
floor	5

ASHTRAY

Typ=6.01
X=5.8 r=.62

ASHTRAY	A%
pubs	55
table	52.5
office	50
house/home	47.5
restraunant	35
cinema	22.5
car	22.5
bus	20
desk	20
train	17.5
public place	17.5
chair	17.5
window sill	15
lounge	12.5
smoking room	12.5
aeroplane	12.5
coach	10
common room	10
hall	7.5
cafe	7.5
club	7.5
hotel	7.5
bar	5
sink	5
house	5
mantlepiece	5
souvenir shop	5

Perceptual Attribute Norms for Items Of Varying Typicality From Nine Semantic Categories

WEAPON	A%
*N=40	
X=5.4 r=.59	
metal	42.5
sharp	32.5
hard	27.5
wooden	22.5
bullets	22.5
missile	17.5
gun	17.5
blade	15
knife	15
pain(ful)	15
cuts	12.5
point	12.5
radioactive	10
war	7.5
death	5
dangerous	5

*[N=40 for all norms]

GUN	A%	DAGGER	A%	WHIP	A%
Typ=1.26		Typ=1.52		Typ=2.95	
X=7.5 r=.83		X=6.3 r=.92		X=5.2 r=.71	
bullet(s)	70	sharp	95	leather	60
trigger	45	point(ed)	52.5	long	55
barrel	45	handle/hilt	50	lash	32.5
metal	42.5	blade	42.5	thong	30
wood	40	metal	37.5	arrows	47.5
loud bang	25	steel	32.5	handle	25
chambers	22.5	short	27.5	thin	17.5
dangerous	22.5	shiny	20	crack	15
handle	22.5	long	17.5	cat'o' 9 tails	12.5
small	20	small	17.5	bullwhip	10
shoots	20	sheath	15	curlin	10
long	17.5	kills	12.5	coil	7.5
steel	10	weapon	7.5	hide	7.5
kills	10	dangerous	7.5	birch	5.0
shiny	10	knife	5	cane	5.0
stock	7.5	wood	5	black	5.0
silencer	7.5	silver	5	hurt(ful)	5.0
weapon	5	bloody	5	pain(ful)	5.0
black	5			horses	5.0
machine gun	5			circus	5.0

BOW (a weapon)	A%
Typ=3.30	
X=4.1 r=.91	
string	62.5
wood(en)	50
long	47.5
arrows	47.5
arc	32.5
curved	25
target	17.5
flexible	12.5
taut	10
bendy	5
twine	5
gut	5

SLINGSHOT	A%
Typ=4.20	
X=3.8 r=.78	
stone	52.5
elastic(bands)	45
leather thong	27.5
David & Goliath	20
cloth	17.5
weapon	12.5
ball	7.5
hard	7.5
catapult	7.5
leather	5
wooden	5
flys	5
string	5
aim	5
fishing	5

TRUNCHEON	A%
Typ=4.86	
X=5.8 r=.85	
long	75
wooden	72.5
hard	70
heavy	47.5
black	32.5
leather	27.5
rubber	22.5
policeman	20
blunt	15
phallic	15
rounded	10
short	10
solid	10
dark	10
smooth	7.5
handle	7.5
slender	5
thin	5
dangerous	5
hit	5

BIRD	A%
X=6.1 r=.93	
feathers	82.5
wings	67.5
beak/bill	55
flys	52.5
legs	45
tail	32.5
webbed feet	30
small	25
large	20
colourful	17.5
black	15
eyes(beady)	15
song/sings	10
talons	7.5
feet	5
chirps	5
claws	5
head	5

ROBIN	A%	BLACKBIRD	A%	PARROT	A%
typ=1.11		Typ=1.14		Typ=2.98	
X=6.7 r=.91		X=5.8 r=.62		X=5.1 r=.81	
redbreast	97.5	black	82.5	talks/talkative	80
feathers	62.5	feathers	55	feathers	55
small	60	yellow bill	47.5	green	52.5
brown	57.5	sings/song	45	beak	50
wings	52.5	beak	35	colourful	40
bird	47.5	wings	32.5	bird	40
christmas	37.5	large	27.5	red	35
beak	32.5	orange beak	22.5	multicoloured	30
(thin) legs	27.5	legs	20	yellow	27.5
flys	22.5	flys	20	blue	20
snow	10	brown	15	wings	15
winter	5	bird	10	squwaks	15
sings	5	small	7.5	long beak	10
feet	5	tail	7.5	noisy	7.5
plump	5	feet	5	caged	7.5
boys name	5	claws	5	voice	7.5
sleek	5			flies	7.5
				long tail	5
				exotic	5
				plumage	5
				large	5
				tropical	5
				curved beak	5
				screeches	5

DUCK	A%	PENGUIN	A%	OSTRICH	A%
Typ=3.02		Typ=4.17		Typ=4.43	
X=5.7 r=.69		X=5.5 r=.7		X=4.6 r=.67	
bill/beak	77.5	black & white	92.5	long neck	55
webbed feet	62.5	bill/beak	50	feathers(ed)	52.5
feathers	52.5	webbed feet	47.5	long legs	50
quacks	52.5	artic/antartic	45	tall	40
brown	35	flightless	37.5	large	35
swims	35	waddles	32.5	black & white	27.5
white	27.5	feathers	27.5	flightless	22.5
water	27.5	wings	25	grey	17.5
wings	25	tubby	17.5	beak	15
swims	25	yellow beak	17.5	legs	15
small	17.5	swims	15	large eggs	12.5
bread	15	flippers	15	buries head	12.8
bird	10	large	12.5	scrraggy	12.5
wet	10	fat	10	large eyes	7.5
dives	10	stout	10	big feet	7.5
eats	7.5	bird	7.5	small wings	5
flys	7.5	short	7.5	tiny head	5
found on ponds	5	fluffy	5	ugly	5
smooth	5	upright	5	large	5
soft	5	sqwauks	5	fast	5
noisy	5	bleets	5	bird	5
greasy	5	slides	5		
meat	5				

VEGETABLE	A%
X=4.3 r=.51	
green	42.5
hard	30
dirty	25
grows	22.5
round	17.5
long	15
colour	15
tasty	12.5
edible	12.5
brown	12.5
ground	10
food	10
seeds	10
skin/peel	7.5
cookable	7.5
leaves	7.5
roots	7.5
peas	5
colour	5
carrots	5
bitter raw	5
potato	5
crisp	5

POTATO	A%	CARROT	A%	CORN	A%
Typ=1.21		Typ=1.28		Typ=2.99	
X=5.7 r=.59		X=6.1 r=.73		X=5.9 r=.67	
brown	52.5	orange	95	yellow	81
round	47.5	long	62.5	cob	47.5
dirty	45	pointed	50	tall	42.5
white	45	green leaves	42.5	sweet	35
eyes	40	tasty	37.5	green	35
peel	40	sweet	32.5	long	30
muddy	32.5	tapered	27.5	flakes	27.5
roast	27.5	muddy	20	stem	25
chips	25	hard	17.5	stalk	25
mashed	17.5	knobbly	15	leaves	20
large	15	crisp	15	ears	17.5
hard	15	roots	12.5	fields	17.5
small	12.5	grows	12.5	buttered	12.5
mis-shapen	10	elongated	10	round	12.5
knobly	10	fat	7.5	swaying	10
thick skinned	7.5	rigid	7.5	vegetable	10
grow in ground	5	narrow	5	foot	7.5
vegetable	5	crunchy	5	boiled	7.5
lumpy	5	peel	5	edible	7.5
roots	5	juice	5	jokes	5
		skin	5	small	5
		edible	5	flour	5
		dirty	5	golden	5
				cereal	5
				old films	5

CRESS	A%	RICE	A%	PEANUT	A%
Typ=3.08		Typ=4.98		Typ=5.73	
X=4.3 r=.58		X=4.8 r=.73		X=5.2 r=.74	
green	82.5	white	87.5	salty(ed)	87.5
thin whitestems	47.5	small	50	small	52.5
small	45	puddings	42.5	brown	50
green leaves	37.5	with curry	40	roasted	45
leaves	32.5	paddyfields	37.5	hard	42.5
mustard	27.5	grains	35	shell	35
seeds	25	long grain	27.5	greasey	32.5
salad	20	brown	25	with alchohol	27.5
muddy roots	17.5	hard	25	oval	17.5
blotting paper	15	fluffy	20	crunchy/chewy	17.5
grown in water	12.5	sticky	17.5	yellow	12.5
tasteless	12.5	oval	17.5	packets	12.5
tasty	10	fried	12.5	rich in protein	10
black seeds	10	edible	12.5	brittle	7.5
stalks	10	small grain	10	breaks in two	7.5
tendrils	10	foreign	7.5	edible	5
spindly	7.5	boiled	7.5	dry roasted	5
wet	7.5	chinese food	7.5	kernel	5
edible	5	food	7.5	oily	5
garnish	5	yellow	5	tasty	5
bitter	5	swells	5	K.P	5
sharp	5	curvy	5		
peppery	5	tatsy	5		
crisp	5	bland	5		
limp	5	starchy	5		

CLOTHING	A%
X=4.1 r=4.5	
warm	47.5
soft	35
sleeves	30
woollen	27.5
material	20
legs	20
bright colours	17.5
comfortable	15
buttons	15
pockets	12.5
lapels	12.5
collar	10
shirt	7.5
arms	7.5
cotton	7.5
nylon	5
coat	5
zips	5
acrylic	5
jeans	5

JACKET	A%	SHIRT	A%	PYJAMAS	A%
Typ=1.24		Typ=1.25		Typ=2.87	
X=3.9 r=4.2		X=5.6 r=.83		X=3.0 r=.49	
sleeves	55	collar	75	stripes(d)	67.5
warm	45	sleeves	60	two piece	37.5
pockets	37.5	buttons	57.5	buttons	20
velvet	27.5	white	50	cord	20
button(s)	25	cotton	47.5	nightwear	17.5
clothing	20	cuffs	20	baggy	17.5
black	17.5	stripes	17.5	soft	15
dark blue	15	tail	12.5	warm	15
vented back	15	nylon	7.5	collar	10
checked	12.5	tie	7.5	cotton	10
collar	12.5	various colours	7.5	legs	10
leather	12.5	button holes	7.5	clothes	7.5
wool	10	checked	5	sleeves	7.5
double breasted	7.5	ironing	5	blue & white	7.5
belted	5	light	5	flannel	5
twill	5	plain	5	men's apparell	5
soft	5	patterened	5	hot	5
smart	5	pockets	5	bed	5
large	5	silk	5	arms	5
two arms	5			silk	5
anorak	5			paisely	5
blazer	5			partywear	5
tweed	5			fleecy	5
potato skin	5			frilly	5

NYLONS	A%	HAIRBAND	A%	PURSE	A%
Typ 3.25		Typ=6.06		Typ=6.47	
X=4.8 r=.40		X=3.6 r=.62		X=5.4 r=.81	
stockings	47.5	coloured	42.5	leather	85
silky	40	elastic	42.5	clip	40
sheer	37.5	velevet	27.5	clasp	37.5
seam	32.5	stretchy	25	zip	37.5
brown	32.5	tidy	17.5	compartments	30
suspenders	27.5	long hair	15	brown	15
legs	17.5	ribbon	12.5	black	15
long	15	nylon	12.5	small	12.5
coloured	10	plastic	7.5	wallet	12.5
dark	10	wide	7.5	metal catch	10
smooth	7.5	cloth	7.5	round	7.5
sexy	7.5	red	5	square	7.5
tops	7.5	old fashioned	5	divided	5
feet	7.5	holds hair	5	change	5
laddered	5	thick	5	cheque	5
tights	5	circular	5	tickets	5
black	5	white	5	bills	5
tan	5	black	5	receipits	5
net	5	ballet	5		
sleek	5				
clinging	5				
soft	5				
fine	5				
heel	5				

FURNITURE	A%
X=4.1 r=.38	
wooden	52.5
large	30
hard	27.5
legs	20
soft	17.5
corners	15
small	12.5
plastic	12.5
comfortable	10
expensive	10
metal	7.5
arms	7.5
back	7.5
covered	7.5
flat surface	5
work on	5
sit	5
cushion	5
seat	5
bed	5
chair	5
eat off	5
large	5

TABLE	A%	BED	A%	MIRROR	A%
Typ=1.23		Typ=1.29		Typ=4.48	
X=7.6 r=.56		X=7.3 r=.62		X=5.9 r=.72	
wood(en)	95	soft	47.5	reflects	75
square	60	sheets	47.5	glass	60
four legs	50	mattress	45	shiny/shine	30
legs	47.5	sleep(on)	42.5	silver(ed)	27.5
polished	30	warm	27.5	wood frame	27.5
round	30	pillow	25	large	20
flat	20	rectangle(ular)	25	square	17.5
brown	20	blankets	22.5	round	15
eat off	20	comfortable	20	hangs on wall	15
leaf	15	long	15	ornate	12.5
grain(ed)	10	wooden	15	flat	12.5
oak	10	springs	15	small	12.5
shiny	7.5	duvet	12.5	smooth	10
oblong	7.5	wide	12.5	clear	10
work on	7.5	cosey	12.5	clean	5
tablecloth	7.5	large	10	sharp corners	5
metal	5	head	10	rectangle	5
plastic	5	double	10	oval	5
glass	5	single	7.5	cracked	5
shiny	5	pillow	7.5	smoked	5
smooth	5	flat	7.5		
oval	5	oblong	7.5		
long	5	square	7.5		
black	5	big	5		
top	5	springy	5		
nested	5	hard	5		
		foot	5		
		covered	5		
		quilt	5		
		canopied	5		
		bolster	5		

RUG	A%	TELEPHONE	A%	ASHTRAY	A%
Typ=4.49		Typ=5.69		Typ=6.01	
X=5.8 r=.55		X=7.4 r=.87		X=6.3 r=.69	
wool(ly)	47.5	dial	62.5	dirty	77.5
square	32.5	ring	57.5	glass	55
small	30	receiver	47.5	smelly	50
fringed	30	plastic	45	round	47.5
round	27.5	black	25	contains ash &	
soft	22.5	talk	25	used cigarettes	47.5
warm	20	speakthrough	22.5	square	22.5
rectangular	20	buttons	20	metal	20
shaggy	17.5	bell	20	heavy	17.5
piece of carpe	17.5	numbers	20	ash	17.5
fire	15	wires	20	wood(en)	12.5
pile	15	red	17.5	plastic	12.5
woven	12.5	white	15	smoke	10
sheep's skin	12.5	coloured	15	small	10
cosy	10	box	15	filthy	7.5
patterned	10	cream	12.5	corners	7.5
hearth rug	7.5	communicate	12.5	dish	7.5
flat	7.5	engaged	10	pottery	5
goat's skin	7.5	handle	10	indents	5
oval	5	mouthpiece	7.5	lipstick	5
large	5	speaker	7.5	writing	5
nylon	5	earpiece	7.5	pipe	5
tuft	5	lead	5		
many colours	5	dialing tone	5		
fluffy	5	directory	5		
mat	5				

FRUIT	A%
X=4.3 r=.54	
soft	45
juicy	37.5
sweet	30
yellow	25
green	25
red	22.5
pips	17.5
skin	15
edible	15
stalks	10
hard	7.5
small	7.5
round	7.5
orange	5
peel	5
tastey	5
apple	5
stem	5
leaves	5
bananna	5

APPLE	A%	PEAR	A%	BERRY	A%
Typ=1.15 X=7.1 r=.82		typ=1.30 X=6.1 r=.78		Typ=3.41 X=5.9 r=.67	
green	95	green	87.5	red	75
red	92.5	juicy	52.5	black	67.5
round	52.5	stalk	47.5	round	50
pips	50	soft	30	small	47.5
sweet	50	tree	30	juicy	30
juicy	47.5	fruit	30	poison(ous)	25
core	25	sweet	22.5	(grows on)bush	25
tree	17.5	brown	17.5	wine	15
peel/skin	15	hard	12.5	birds eat them	15
crisp	12.5	yellow	10	fruit	12.5
yellow	12.5	skin/peel	10	wild	7.5
shiny	10	tasty	7.5	sweet	7.5
sour	5	pips/seeds	7.5	logan	5
stalk	5	tear-shaped	7.5	pies	5
hard	5	bulbous	5	winter	5
fruit	5	orchard	5	autumn	5
edible	5	rounded	5	bunches	5
white flesh	5	small	5	edible	5
crunchy	5	rough skin	5	elder	5
computer	5	spots	5	smooth	5
		firm	5	hard	5
		oval	5	soft	5
				mull-	5

PRUNES	A%	OLIVE	A%	PICKLE	A%
Typ=3.84		Typ=5.57		Typ=6.64	
X=5.1 r=.83		X=6.5 r=.79		X=7.1 r=.59	
black	77.5	green	92.5	brown	50
wrinkled	62.5	black	75	onion	47.5
soft	32.5	oil(y)	47.5	spicy	45
juicy	32.5	bitter	40	vinegar	35
stones	37.5	small	37.5	sweet	30
custard	25	stuffed	35.	tasty	25
sweet	20	Greece	27.5	sour	22.5
school	15	oval	22.5	sharp	17.5
dried	15	round	20	gerkin	17.5
fruit	7.5	trees	15	tangy	15
dark	7.5	red dot	12.5	yellow	12.5
shrivelled	7.5	fruit	10	lumpy	12.5
crinkley	5	cocktail	10	chunky	10
dried plums	5	sour	7.5	sticky	10
syrup	5	branch	5	ploughman's	7.5
laxitive	5	leaves	5	chutney	7.5
		groves	5	fruity	7.5
		smooth	5	hot	7.5
				savoury	7.5
				green	5
				Pan Yan	5
				piccallili	5
				runny	5
				sauce	5
				mango	5
				lime	5

VEHICLE

X=6.6 r=.78

wheels	52.5
transport	45
metal	37.5
large	30
motorised	30
engine	27.5
windows	20
movement	20
seat	17.5
car	15
brakes	15
tires	12.5
carries	10
bike	10
door	7.5
bus	7.5
carriages	7.5
power	5
big	5
train	5
speed	5

CAR	A%	BUS	A%	WAGON	A%
Typ=1.11		Typ=1.26		Typ=3.47	
X=7.4 r=.72		X=7.7 r=.81		X=5.3 r=.71	
wheels	52.5	red	75	wheels	72.5
seats	47.5	green	67.5	wooden	60
metal	45	double decker	55	horse(s)	50
windows	37.5	conducter	27.5	covered	42.5
lights	37.5	fare	27.5	canvas cover	22.5
brakes	22.5	tickets	25	indians	17.5
large	22.5	late	25	large	17.5
fast	20	seats	20	brown	15
steering wheel	17.5	stairs	20	reins	15
engine	15	windows	17.5	western	15
tyres	15	single decker	17.5	old fashioned	12.5
body	15	bell	15	transport	12.5
boot	15	passengers	10	canopy	10
rubber	12.5	wheels	10	cowboys	10
horn	12.5	big	10	circle	7.5
transport	10	large	7.5	four wheeled	7.5
dashboard	10	long	7.5	metal	5
shiny	7.5	stops	7.5	spokes	5
clean	7.5	covered in-	heavy	5	
expensive	7.5	-adverts	7.5	back flaps	5
carry	5	noisy	7.5	painted	5
four wheels	5	tall	5	pull along	5
seat belts	5	heavy	5	freight	5
bonnet	5	smokey	5	gypsy caravan	5
'L' plate	5	driver	5		
big	5	travel on	5		
fast	5	mirror	5		
rust	5	timetable	5		
mirrors	5	engine	5		
motor	5				
door	5				
upholstery	5				
clutch	5				
gears	5				
blue	5				
red	5				

SHIP	A%
Typ=3.68	
X=5.5 r=.41	
large	52.5
funnels	47.5
sails	42.5
metal	40
sea	37.5
floats	25
long	25
passengers	22.5
wood	20
deck(s)	17.5
mast	17.5
big	15
engines	12.5
steam	10
captain	10
crew	10
cabins	7.5
grey	7.5
cargo	7.5
enormous	5
hull	5
ballrooms	5
anchor	5
bow	5
fast	5
stern	5
life boats	5
iron	5
cabins	5

SKIIS	A%
Typ=5.47	
X=6.1 r=.52	
long	92.5
snow	47.5
pointed	30
curves up	27.5
wooden	27.5
smooth	20
thin	17.5
flat	12.5
pairs/two	12.5
coloured	12.5
narrow	12.5
fast	10
speed	7.5
slopes	7.5
winter sports.	7.5
waxed	7.5
plastic	5
fibre glass	5
sharp	5
flat	5
straight	5
sticks	5
boots	5

SURFBOARD	A%
Typ=5.92	
X=5.3 r=.71	
long	67.5
wood(en)	52.5
flat	27.5
thin	22.5
pointed	22.5
curves up	17.5
smooth	15
waves	15
hard	12.5
fiberglass	12.5
plastic	10
oval	10
sleek	10
fast	10
sea	7.5
Malibu	7.5
glides	7.5
coloured	7.5
floats	5
rounded end	5
narrow	5
stand on	5
lie on	5
sail	5
fin	5

SPORT	A%
X=5.1 r=.49	
teams	40
competition	37.5
ball	22.5
run(ing)	22.5
sweat	20
energentic	20
active	17.5
games	17.5
players	15
strip	15
rackets	15
referees	15
spectators	12.5
stadium	10
television	10
horses	7.5
track	7.5
shorts	5
boots	5
shirt	5
trainers	5
winners	5
crowds	5

TENNIS A%

Typ=1.29
X=7.6 r=.78

ball(s)	90
rackets	77.5
net	57.5
court	50
Wimbledon	47.5
game	35
umpire	35
lines	27.5
shorts	25
summer	20
linesmen	20
grass	17.5
white clothes	17.5
white	12.5
fast	10
making strokes	10
sport	10
shirts	10
gravel	7.5
plimsoles	7.5
white skirt	7.5
high chair	5
players	5
crowd	5
catgut	5
serve	5
volley	5

RUGBY A%

Typ=1.35
X=3.8 r=.39

ball	47.5
oval ball	32.5
rough	30
scrum	25
tall goalposts	22.5
striped/hooped--shirts	17.5
players	15
pitch	15
'H' shape posts	12.5
game	12.5
field	10
running	10
muddy	10
men	10
town	7.5
leather ball	7.5
power	7.5
15-a-side	7.5
teams	5
lineout	5
ruck	5
maul	5
shorts	5
violence	5
headbands	5

ARCHERY A%

Typ=3.13
X=5.7 r=.74

arrows	92.5
bow	67.5
target	62.5
bullseye	45
Robin Hood	40
sport	30
quiver	27.5
points	22.5
green	17.5
crossbow	12.5
red	10
blue	10
gold	7.5
straw	7.5
aim	5
pull	5
string	5
wood	5
medieval wars	5

SAILING	A%	CHESS	A%	SUNBATHING	A%
Typ=3.18 X=5.6 r=.52		Typ=5.52 X=6.5 r=.82		Typ=6.92 X=6.9 r=.61	
boat(s)	60	board	72.5	tan	52.5
water	52.5	black & white	60	brown	52.5
wind(y)	52.5	game	52.5	hot/heat	50
sea	47.5	pawns	50	sun	45
dingy	25	squares	30	swimsuit	42.5
wet	20	queen	30	beach	40
lifebelt	17.5	king	27.5	sand	37.5
yatch	15	pieces	27.5	oil	22.5
racing	12.5	chessmen	20	burn(ing)	20
yatch	10	bishops	17.5	lazy	17.5
blue	10	knights	17.5	lying in sun	17.5
white	10	rooks	17.5	warm	17.5
sou'westers	7.5	wooden	12.5	relaxing	12.5
tacking	7.5	checkmate	10	suntan lotions	12.5
rigging	7.5	pieces of wood	7.5	holiday	10
sea gulls	5	carved	7.5	sunglasses	10
lakes	5	ivory	7.5	bikini	7.5
rivers	5	check	5	books	7.5
waves	5	Championships	5	cream	7.5
mast	5	long thought	5	peaceful	7.5
galley	5	skill	5	boring	5
oilskins	5	castles	5	ambre solaire	5
oars	5	warfare	5	topless	5
				nakedness	5
				towel	5
				airbed	5
				sea	5

TOY

X=3.7 r=.41

soft	40
play	37.5
cuddly	30
wooden	27.5
plastic	22.5
legs	17.5
arms	17.5
children	15
shoots	15
bows & arrows	12.5
video games	12.5
tough	10
board games	10
bucket & spade	10
toy gun	5
wheels	5
swings	5
bike	5
cowboy clothes	5
nurse uniform	5

TEDDYBEAR	A%	DOLL	A%	BALLOON	A%
Typ=1.27		Typ=1.44		Typ=3.03	
X=5.8 r=.83		X=4.9 r=.61		X=7.3 r=.54	
cuddly	70	dressed(s)	45	round	77.5
soft	55	plastic	42.5	light	52.5
yellow	50	small	30	coloured	50
brown	27.5	soft	22.5	floats	47.5
legs	25	pretty	22.5	rubber	45
arms	20	large	17.5	red	40
glass eyes	20	pink	17.5	inflatable	35
furry	17.5	eyes	15	blue	25
nose	17.5	arms	12.5	plastic	22.5
golden	15	legs	10	pops	20
orange	12.5	rag	10	hanging basket	17.5
warm	10	girl's toy	10	very large	15
fluffy	10	fixed stare	7.5	full of air	15
eyes	7.5	hair	7.5	long	12.5
small	7.5	blonde	7.5	gas	12.5
black nose	7.5	humanoid	5	yellow	12.5
squeaky	5	cuddly	5	green	10
fat	5	china	5	small	10
ears	5	porcelain	5	squeeks	10
black & orange--eyes	5	clothes	5	string	7.5
friend	5	nylon hair	5	decoration	7.5
				fun	7.5
				bang	5
				flys	5
				R101	5
				sandbags	5
				funny shapes	5

SKATES	A%
Typ=3.12	
X=4.7 r=.63	
wheels	72.5
ice	52.5
roller	47.5
blades	25
boots	22.5
laces	20
white	20
straps	15
fast	12.5
metal	12.5
ball bearings	10
sharp	7.5
buckles	7.5
speed	5
rink	5
frozen lakes	5
cold	5
shoes	5
steel	5

STILTS	A%
Typ=3.69	
X=4.4 r=.78	
wooden	87.5
tall[er]	60
long	30
clowns	27.5
two	25
thin	25
pillars	17.5
handles	15
high	12.5
circus	12.5
narrow	10
walk on	7.5
straight	5
bits for feet	5
wobble	5
striped trouser	5

CARDS	A%
Typ=5.34	
X=5.2 r=.39	
playing	37.5
small	25
numbered	25
pack	20
rectangular	20
greetings	20
red	17.5
black	17.5
cardboard	15
hearts	15
games	15
pictures	12.5
patterned	12.5
trumps	10
birthday	7.5
tricks	7.5
diamonds	7.5
clubs	5
whist	5
christmas	5
post	5
'get-well-soon'	5
employment	5
plastic	5
coloured	5
fifty two	5
suits	5
jokers	5
ace	5
king	5
jack	5
poker	5
bridge	5

Stimuli employed in experiment 7

The exemplars and attribute statements used in experiment 7 are listed in two sets. Each set contains 36 true followed 36 false attribute statements and corresponding exemplars.

Set 1

Exemplar [True]	Attribute Statement
BED:	FOUND IN A BEDROOM
MIRROR:	FOUND IN A BATHROOM
TELEPHONE:	FOUND IN THE OFFICE
APPLE:	KEPT IN A FRUIT BOWL
PRUNES:	ARE SOLD IN TINS
PICKLE:	IS SOLD IN JARS
SHIRT:	OFTEN WORN BY MEN
NYLONS:	WORN ON THE LEGS
HAIRBAND:	WORN ON THE HEAD
TABLE:	CAN BE MADE OF WOOD
RUG:	MAY HAVE A FRINDGE
ASHTRAY:	CAN BE VERY DIRTY
PEAR:	ARE GREEN IN COLOUR
BERRY:	ARE USUALLY SMALL
OLIVE:	CAN BE VERY OILY
JACKET:	USUALLY HAS SLEEVES
PYJAMAS:	CAN HAVE STRIPES
PURSE:	IS MADE OF LEATHER
TABLE:	KEPT IN DINNING ROOM
RUG:	FOUND BY THE FIRESIDE
ASHTRAY:	OFTEN FOUND IN PUBS
PEAR:	IS FOUND ON A TREE
BERRY:	IS FOUND ON A BUSH
OLIVE:	IS GROWN IN ITALY
JACKET:	KEPT IN A WARDROBE
PYJAMAS:	OFTEN WORN IN BED

Exemplar [True]	Attribute Statement
PURSE:	KEPT IN A HANDBAG
BED:	CAN HAVE A MATTRESS
MIRROR:	SHOWS A REFLECTION
TELEPHONE:	USUALLY HAS A DIAL
APPLE:	ARE RED IN COLOUR
PRUNES:	ARE VERY WRINKLED
PICKLE:	CAN CONTAIN ONION
SHIRT:	USUALLY HAS A COLLAR
NYLONS:	USUALLY ARE SILKY
HAIRBAND:	IS MADE OF ELASTIC

Exemplar [False]	Attribute Statement
POTATO:	SOLD IN A CHEMISTS
CORN:	GROWS ON TREES
PEANUTS:	GROWN IN ICELAND
BLACKBIRD:	FOUND IN A SALAD
PARROT:	KEPT IN A TIN
OSTRICH:	FOUND IN A DESK
TENNIS:	PLAYED AT SEA
ARCHERY:	PRACTISED IN A BATH
SUNBATHING:	DONE IN A CUPBOARD
CARROT:	IS BLUE IN COLOUR
CRESS:	CAN BE VERY TALL
RICE:	IS RED IN COLOUR
ROBIN:	CAN BE VERY TALL
DUCK:	HAS VERY SHARP CLAWS
PENGUIN:	HAS FOUR LEGS

Exemplar [False]	Attribute Statement
RUGBY:	USES CLAY PIGEONS
SAILING:	IS DONE ON STILTS
CHESS:	PLAYED WITH RACKETS
CARROT:	IS KEPT IN A CAGE
CRESS:	FOUND IN ICECREAM
RICE:	GROWN IN SCOTLAND
ROBIN:	LIVES IN A BOTTLE
DUCK:	FOUND IN A BEDROOM
PENGUIN:	LIVES IN DESERTS
RUGBY:	PLAYED ON A TABLE
SAILING:	IS DONE ON GRASS
CHESS:	PLAYED ON AN COURT
POTATO:	IS SQUARE IN SHAPE
CORN:	IS GREY IN COLOUR
PEANUTS:	ARE EXTREEMLY BIG
BLACKBIRD:	IS COVERED IN FUR
PARROT:	IS COVERED IN SCALES
OSTRICH:	HAS TWO LONG FANGS
TENNIS:	PLAYED WITH A LANCE
ARCHERY:	IS DONE USING STONES
SUNBATHING:	IS DONE USING JAM

Set 2

Exemplar	Attribute Statement [True]
POTATO	SOLD IN A GROCERS'
CRESS	SERVED IN SALAD
RICE	SERVED WITH CURRY

Exemplar	Attribute Statement [True]
ROBIN	PERCHES IN A TREE
PARROT	KEPT IN A CAGE
OSTRICH	FOUND AT THE ZOO
RUGBY	PLAYED ON A PITCH
SAILING	IS DONE ON WATER
CHESS	PLAYED ON A BOARD
CARROT	IS OFTEN POINTED
CORN	IS BRIGHT YELLOW
PEANUTS	ARE OFTEN SALTED
BLACKBIRD	HAS BLACK FEATHERS
DUCK	HAS WEBBED FEET
PENGUIN	IS BLACK AND WHITE
TENNIS	PLAYED WITH A BALL
ARCHERY	DONE USING A BOW
SUNBATHING	IS GETTING TANNED
CARROT	ARE OFTEN TINNED
CORN	IS GROWN IN FIELDS
PEANUTS	SOLD IN PACKETS
BLACKBIRD	SEEN IN THE GARDEN
DUCK	IS FOUND ON A POND
PENGUIN	LIVES AT SOUTH POLE
TENNIS	DONE AT WIMBLEDON
ARCHERY	PRACTICED IN A FIELD
SUNBATHING	IS DONE ON A BEACH
POTATO	IS BROWN IN COLOUR
CRESS	HAS GREEN LEAVES
RICE	IS WHITE IN COLOUR

Exemplar	Attribute Statement [True]
ROBIN	HAS A REDBREAST
PARROT	IS USUALLY GREEN
OSTRICH	HAS A LONG NECK
RUGBY	USES TALL GOAL POSTS
SAILING	NEEDS A BRISK WIND
CHESS	PLAYED WITH PAWNS

Exemplar	Attribute Statement [False]
TABLE	KEPT IN A TOILET
MIRROR	STORED IN A TIN
ASHTRAY	SOLD IN A GROCERS'
APPLE	KEPT IN A TOOL BOX
BERRY	IS GROWN IN WATER
OLIVE	IS GROWN IN SUGAR
SHIRT	KEPT IN A BARREL
PYJAMAS	WORN AT THE OFFICE
HAIRBAND	WORN ON THE KNEECAP
BED	IS MADE OF ROCK
RUG	IS MADE OF CLAY
TELEPHONE	IS MADE OF WOOL
PEAR	IS PINK IN COLOUR
PRUNES	ARE MADE OF METAL
PICKLE	IS MADE OF EGGS
JACKET	IS WORN ON SHINS
NYLONS	ARE MADE OF SACK
PURSE	IS MADE OF GLASS

Exemplar	Attribute Statement [False]
BED	STORED IN A FIELD
RUG	KEPT IN A POCKET
TELEPHONE	FOUND IN A BOTTLE
PEAR	SOLD IN A TOYSHOP
PRUNES	ARE SOLD IN TUBES
PICKLE	IS SOLD IN BINS
JACKET	WORN ON THE NOSE
NYLONS	WORN ON THE EARS
PURSE	KEPT IN THE OVEN
TABLE	IS MADE OF COTTON
MIRROR	IS MADE OF STRING
ASHTRAY	IS MADE OF CREAM
APPLE	TAPERS TO A POINT
BERRY	IS MADE OF METAL
OLIVE	IS A BRIGHT RED
SHIRT	IS MADE OF IRON
PYJAMAS	ARE MADE OF BRICK
HAIRBAND	IS MADE OF PASTRY

Stimuli employed in experiment 8

The 96 dual cues employed in experiment 8 are listed on the following pages in the format in which they were presented. The exemplars for which they were cues are they same as those employed in experiment 4 [with the exception of the category Weapon] see appendix C.

1 PERSON / WARDROBE: ______________________________?

2 LEGS / SHOPS: ______________________________?

3 HANDBAG / POCKET: ______________________________?

4 TREE / TINS: ______________________________?

5 BUSH / TREE: ______________________________?

6 GREECE / ITALY: ______________________________?

7 BED / TOYSHOP: ______________________________?

8 PARTY / FAIRGROUND: ______________________________?

9 CIRCUS / PLAYGROUND: ______________________________?

10 GARDEN / TREE: ______________________________?

11 CAGE / ZOO: ______________________________?

12 ANTARTIC / ZOO: ______________________________?

13 GARDEN / GREENGROCERS': ______________________________?

14 FIELDS / TIN: ______________________________?

15 PACKET / PUB: ______________________________?

16 ROAD / STATION: ______________________________?

17 WESTERNS / RAILWAYS: ______________________________?

18 SEA / CALIFORNIA: ______________________________?

19 COURTS / WIMBLEDON: ______________________________?

20 MEADOW / SHERWOOD FOREST: ______________________________?

21 CLUB / RUSSIA: ______________________________?

22 BEDROOM / HOSPITAL: ______________________________?

23 FLOOR / FIRESIDE: ______________________________?

24 OFFICE / BOX: ______________________________?

25 RED / DOUBLE DECKER: ______________________________?

26 WOODEN / WHEELS: ______________________________?

27 LONG / WOODEN: ______________________________?

28 BALLS / RACQUETS: ______________________________?

29 ARROWS / TARGET:______________________________?

30 BOARD / BLACK & WHITE:______________________________?

31 SOFT / SHEETS:______________________________?

32 WOOLLY / FRINGED:______________________________?

33 RING / DIAL:______________________________?

34 REDBREAST / FEATHERS:______________________________?

35 TALKS / GREEN:______________________________?

36 BLACK & WHITE / BEAK:______________________________?

37 ORANGE / LONG:______________________________?

38 YELLOW / COB:______________________________?

39 SALTY / BROWN:______________________________?

40 SLEEVES / PACKETS:______________________________?

41 SILKY / SHEER:______________________________?

42 CLIP / ZIP:______________________________?

43 JUICY / TREE:______________________________?

44 BLACK / RED:______________________________?

45 GREEN / BLACK:______________________________?

46 CUDDLY / SOFT:______________________________?

47 ROUND / INFLATED:______________________________?

48 WOODEN / SUPPORT:______________________________?

49 GARAGE / ROAD:______________________________?

50 SEA / DOCK:______________________________?

51 SNOW / SWITZERLAND:______________________________?

52 FIELD / TWICKENHAM:______________________________?

53 LAKE / SEA:______________________________?

54 BEACH / GARDEN:______________________________?

55 DINNINGROOM / OFFICE:______________________________?

56 BATHROOM / HALL:______________________________?

57 TABLE / PUB:______________________________?

58 TREES / GARDEN: ____________________?

59 POND / LAKE: ____________________?

60 ZOO / AFRICA: ____________________?

61 GREENGROCERS' / FIELD: ____________________?

62 SALAD / GREENGROCERS': ____________________?

63 PADDYFIELDS / CURRY: ____________________?

64 SHOP / WASHING LINE: ____________________?

65 BED / BEDROOM: ____________________?

66 HEAD / HAIR: ____________________?

67 PIE / TREE: ____________________?

68 TINS / SUPERMARKET: ____________________?

69 JAR / SANDWICH: ____________________?

70 PRAM / SHOP: ____________________?

71 ICE RINK / SPORTS SHOP: ____________________?

72 CASINO / GAMES SHOP: ____________________?

73 WHEELS / SEAT: ____________________?

74 LARGE / FUNNELS: ____________________?

75 LONG / POINTED: ____________________?

76 GAME / BALL: ____________________?

77 BOAT / WATER: ____________________?

78 TAN / BROWN: ____________________?

79 WOODEN / SQUARE: ____________________?

80 REFLECTION / GLASS: ____________________?

81 DIRTY / GLASS: ____________________?

82 BLACK / FEATHERS: ____________________?

83 BILL / WEBBED FEET: ____________________?

84 LONG NECK / FEATHERS: ____________________?

85 BROWN / ROUND: ____________________?

86 GREEN / SMALL:______________________________?

87 WHITE / SMALL:______________________________?

88 COLLAR / BUTTONS:______________________________?

89 STRIPED / STRING (CORD):______________________________?

90 ELASTIC / COLOURED:______________________________?

91 RED / GREEN:______________________________?

92 BLACK / WRINKLED:______________________________?

93 SPICY / BROWN:______________________________?

94 PLASTIC / DRESSED:______________________________?

95 BLADE / WHEELS:______________________________?

96 PLAYING / PACK:______________________________?